

## Appendix F—Institutional Frameworks Case Studies and Institutional Approaches Used in Other States

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## Institutional Frameworks Case Studies Summary Sheet

	<b>Verde Carter Park, CA</b>	<b>Barber Orchard, NC</b>	<b>Bunker Hill, ID</b>	<b>Lowell, MA</b>	<b>Mount Laurel, NJ</b>
<b>Past land use</b>	Battery factory, residences	Orchard	Mine, metal smelters	Industrial	Orchard
<b>Current/future land use</b>	Residences, school, park	Residences	Residences, schools, parks	School, businesses, ballpark, arena	Residences, recreational facilities
<b>Sources of contamination</b>	Smelter emissions, rock w/ arsenic, lead in paint & gas	Pesticides	Smelter emissions, mining & milling wastes, bag house fire	Industrial wastes	Pesticides
<b>Main contaminants</b>	Lead, arsenic	Arsenic, lead, organic pesticides	Lead, arsenic, cadmium, & zinc	Lead	Arsenic
<b>Arsenic soil concentrations</b>	Up to 734 ppm at park only	Up to 1340 ppm	Not available	Up to 180 ppm, avg. 23 ppm	<50 ppm
<b>Lead soil concentrations</b>	<50–3000 <sup>+</sup> ppm at residences; up to 6700 ppm at park	Up to 3090 ppm	35–24,600 ppm (avg. ~1170-4860 ppm) in towns	Up to more than 10,000 ppm; avg. 1100 ppm	<400 ppm
<b>Who did &amp; paid for soil sampling</b>	City, School District, EPA, PRP	State, EPA	State, CDC, EPA, Health District	Developers	Developers
<b>Type of health assessment</b>	Blood-lead screening	Blood & urine testing, exposure pathways analysis	Epidemiological & environmental investigations	None	None
<b>Who did &amp; paid for health assessment</b>	ATSDR and County	ATSDR	State, CDC, EPA, Health District	N/A	N/A
<b>Type of education and outreach</b>	Door-to-door outreach, public meetings, written materials, interior & exterior lead hazard reduction	Public meetings, notification to property owners	Community task force, public meetings, brochures, etc.	Multi-lingual education program, community meetings, neighborhood planning	Notification & health recommendations for property owners, State educational materials

	<b>Verde Carter Park, CA</b>	<b>Barber Orchard, NC</b>	<b>Bunker Hill, ID</b>	<b>Lowell, MA</b>	<b>Mount Laurel, NJ</b>
<b>Who did the education &amp; outreach</b>	County, HUD, EPA, community representatives, others	EPA, County	Health District	City	Township, State
<b>Who paid for education &amp; outreach</b>	HUD, EPA, PRP, County	EPA, County	PRPs, EPA	City	Township, State
<b>Type of physical protection measures</b>	Soil removal & replacement, capping initially	Soil removal & replacement, other options are being studied	Soil removal & replacement, revegetation, dust suppression	Consolidation & capping, soil removal	Consolidation & capping, soil removal & replacement, soil blending/ tilling (nothing for existing homes)
<b>Who implemented &amp; paid for physical protection measures</b>	PRP, City	EPA	PRPs, EPA, State	Developers	Developers, farmers
<b>Technical assistance/ services</b>	Interior & exterior lead hazard evaluation & abatement	None	Respirators, coveralls, plastic, gravel, vacuums, clean fill available	Assistance developing community plans; assistance for municipalities, buyers, & sellers in redeveloping brownfields	None
<b>Who provided the assistance/ services</b>	County	N/A	Health District	City neighborhood planning specialist; State brownfields office	N/A
<b>Who paid for the assistance/ services</b>	HUD, EPA, PRP, County	N/A	PRPs	City, State	N/A
<b>Type of land-use controls</b>	None	None at present	Large project work permits, interior work permits, & barrier option plans	Deed restrictions and deed notices (Activity and Use Limitations)	Deed notices

	<b>Verdesse Carter Park, CA</b>	<b>Barber Orchard, NC</b>	<b>Bunker Hill, ID</b>	<b>Lowell, MA</b>	<b>Mount Laurel, NJ</b>
<b>Who monitored &amp; enforced land-use controls</b>	N/A	N/A	Health District	City	Property owners have biennial certification/ reporting requirements to State
<b>Who paid for monitoring, enforcement &amp; administration</b>	N/A	N/A	PRPs	City	State
<b>Funding mechanisms (other than direct payments)</b>	HUD env./ econ. justice grant, EPA brownfields grant, County grants/ loans to residents	Superfund Trust fund	Superfund Trust fund	EPA & State brownfields tax incentives, EPA revolving loan fund, State redevelopment fund, City loans for cleanup	No financial assistance
<b>Legal authority</b>	Federal voluntary cleanup	Superfund	Superfund	State voluntary cleanup	Township soil testing & cleanup ordinance, State voluntary cleanup
<b>Liability protections</b>	Site close- out letter		RODs	Statutory liability relief, Covenant Not to Sue, State- subsidized env. insurance	No Further Action Letter/ Covenant Not to Sue, Innocent Purchaser Protection

# **Institutional Frameworks Case Study**

## **Verdesse Carter Park, Oakland, California**

### **1.0 Introduction/Summary**

Verdesse Carter Park is a city-owned park in Oakland, CA constructed on the site of a former battery-manufacturing factory. The park, the residential area surrounding it, and a nearby elementary school were contaminated with lead from the battery factory. In addition, many of the homes in the area had contamination from lead-based paint and leaded gasoline deposition from nearby interstate highways. The City of Oakland and AlliedSignal, the company that had owned the battery factory, voluntarily removed contaminated soils from the park and nearby residences under the oversight of the Environmental Protection Agency (EPA) and the Alameda County Public Health Department. Along with the soil removal activities, the Alameda County Lead Poisoning Prevention Program (ACLPPP), the U.S. Department of Housing and Urban Development (HUD), EPA, other agencies, and community representatives conducted a coordinated effort to educate and inform residents about lead hazards, methods to reduce exposure, and options for lead-hazard assessment and abatement.

The remainder of this case study is organized as follows.

- Section 2 provides background on the site, the sources of contamination, key players, and a chronology of major milestones.
- Section 3 describes how contamination problems were identified and addressed.
- Section 4 discusses the protective measures that have been considered and selected to address the contamination.
- Section 5 outlines funding sources and legal authorities employed.
- Section 6 discusses lessons learned from problem assessment and the implementation of protective measures.
- Section 7 lists references consulted for the case study.

### **2.0 Background**

#### **2.1 Site Description**

Verdesse Carter Park is a three-acre park in East Oakland, California. A battery-manufacturing factory operated on the southern half of the Verdesse Carter Park property from 1921 to 1975, and a commercial greenhouse operated on another portion of the property from 1912 through the early 1970s. The factory cracked and recycled lead from used batteries as well as melted lead to manufacture new batteries. The City of Oakland acquired the park property in 1975 from AlliedSignal for a nominal charge and, after demolishing the factory and removing 5,700 cubic yards of soil, converted the property into a park in 1978.

Land uses near the park consist of residential areas and an elementary school. The area of concern for soil contamination from the battery factory included the park, a nearby elementary school, and a seven-block residential area adjacent to the park. Thirty-six properties are directly adjacent to the park, and about 180 properties are considered to be within the factory's smelter plume. Most of the homes near Verdesse Carter Park predate the development of the park: eighty-four percent of the homes were built before 1950.

The Elmhurst District of East Oakland, where Verdesse Carter Park is located, is a low-income community of color. The majority of residents in the five census tracts surrounding Verdesse Carter Park are African American and Latino, and the median income of the area ranges from 56% to 86% of the median income

for Alameda County. Over 75,000 people live in East Oakland, which comprises the Elmhurst and Central East Oakland neighborhoods. About 1,200 children are enrolled at the E. Morris Cox Elementary School near Verdesse Carter Park.

The main concern in responding to contamination in the Verdesse Center Park area was protection of the health of residents, primarily children, from the potential adverse affects of lead exposure. Community residents and the agencies involved with the cleanup also considered addressing risks from contamination to be an issue of environmental justice. Because the site is in an urban developed area, ecological risks were not a concern during site assessments and cleanup activities in the Verdesse Carter Park area.

## **2.2 Sources of Contamination**

The primary contaminant of concern in the Verdesse Carter Park area was lead. Sources of contamination included acidic discharges and runoff from the former battery factory, air deposition from the factory's lead smelter, lead-based paint used at older buildings and homes, and leaded gasoline and tailpipe emissions from the nearby interstate highway. In addition, some of the gravel at the Verdesse Carter Park site consisted of rhyolite, which contains naturally occurring arsenic.

## **2.3 Key Players and Roles**

Organizations involved in the assessment and remediation of contamination in the Verdesse Carter Park area included the following.

- The African American Development Association, a community activist organization, initially demanded further investigation of health effects from the contamination at Verdesse Carter Park and later participated in outreach and educational efforts about the blood lead screening event and individual protection measures.
- AlliedSignal, the former owner of the battery factory and therefore a potentially responsible party (PRP), conducted soil sampling in residential areas to characterize the likely extent of lead contamination from smelter emissions, voluntarily remediated residential yards near the park under EPA oversight, and helped fund additional protective measures.
- The City of Oakland initially cleaned up and constructed Verdesse Carter Park in the 1970s and later, in the mid-1990s, conducted soil sampling in the park in response to residents' complaints. The City also participated in the development of a strategic plan for the park and removed contaminated soil and arsenic-containing rock from the park.
- The Oakland Unified School District tested and cleaned up contaminated soil at the E. Morris Cox Elementary School near Verdesse Carter Park.
- The Alameda County Lead Poisoning Prevention Program helped organize a blood lead screening event at the elementary school, participated in the development of a strategic plan for the park, conducted and coordinated outreach and educational efforts, and offered lead hazard assessment and abatement services to residents.
- The Alameda County Public Health Department oversaw the City of Oakland's cleanup of the park and the Oakland Unified School District's cleanup of the elementary school and participated in the development of a strategic plan for the park.
- The U.S. Agency for Toxic Substances and Disease Registry (ATSDR) organized a blood lead screening event at the elementary school along with ACLPPP and participated in the development of a strategic plan for the park.
- The Environmental Protection Agency Region 9 sampled soils at residences near the park, participated in the development of a strategic plan for the park, hosted public meetings and conducted

door-to-door outreach for the soil sampling and remediation activities, and oversaw AlliedSignal's cleanup of residential yards.

- The U.S. Department of Housing and Urban Development jointly conducted door-to-door outreach with ACLPPP about interior lead hazards such as lead-based paint and provided much of the funding for ACLPPP's lead hazard abatement services and outreach.

## 2.4 Chronology of Events

I. Date	II. Activity
1921–75	▪ Battery factory operates on Verdese Carter Park site.
1975	▪ The City of Oakland acquires three-acre park site.
1976–78	▪ The City removes 5,700 cubic yards of lead-contaminated soil and constructs Verdese Carter Park.
1993	<ul style="list-style-type: none"> <li>▪ Residents notify the City of yellow-white substance in cracks of paved basketball court at park in March.</li> <li>▪ The City closes and fences the park and samples soils starting in April.</li> <li>▪ Alameda County and ATSDR offer blood lead screening at the elementary school for young children living in the neighborhood in September.</li> <li>▪ The Oakland Unified School District tests soils at the nearby elementary school and removes lead-contaminated surface soils.</li> </ul>
1994	<ul style="list-style-type: none"> <li>▪ A large door-to-door educational campaign is conducted in the Elmhurst District of Oakland about lead poisoning prevention in March.</li> <li>▪ The African American Development Association petitions the EPA to re-evaluate the Verdese Carter Park project in September.</li> <li>▪ The City removes an additional 17,000 cubic yards of contaminated soil and arsenic-containing rock from the park in the fall.</li> <li>▪ Alameda County, EPA, ATSDR, and the City develop a “Strategic Plan for Verdese Carter Park.”</li> </ul>
1994–95	▪ EPA conducts three sampling studies of over 100 homes in a seven-block residential area around the park.
1996	<ul style="list-style-type: none"> <li>▪ AlliedSignal voluntarily removes soil at 23 residential properties where lead soil concentrations exceed 1000 ppm and property owners provide access.</li> <li>▪ Alameda County provides lead-based paint abatement services when requested at homes where soil removal occurs.</li> <li>▪ The City reopens Verdese Carter Park.</li> </ul>
1998–99	<ul style="list-style-type: none"> <li>▪ AlliedSignal voluntarily conducts soil sampling at 49 residential properties and removes soil at 13 properties that have soil lead concentrations above area background levels.</li> <li>▪ Alameda County provides lead-based paint abatement services when requested at homes where soil removal occurs.</li> </ul>
2001	▪ EPA issues a “site close out” letter acknowledging that AlliedSignal has completed all necessary response actions on a voluntary basis.

### **3.0 Problem Assessment**

#### **3.1 Discovery of Contamination**

In 1993, community residents noticed a yellow-white substance in the cracks of a paved basketball court at Verdese Carter Park and notified the City of Oakland about their concerns. In response, the City closed the park and conducted soil sampling to determine whether contaminant levels could pose a health risk to the community. The Oakland Unified School District also tested soils at the elementary school near Verdese Carter Park.

Although the City of Oakland removed some soil from the former battery factory site before developing it into a park in 1978, later soil sampling showed that there were elevated levels of arsenic and zinc below the basketball area and elevated levels of lead in the topsoil of some areas at the park. Soil concentrations at Verdese Carter Park were as high as 734 ppm for arsenic, 6,700 ppm for lead, and 7,450 ppm for zinc. Soils at the elementary school, which was built after the park, also had elevated levels of lead in surface soils, with concentrations in exposed soils above 6,000 ppm. Levels of lead in residential yards were as high as 10,000 ppm for properties adjacent to the park. Area background concentrations of lead in soil outside the smelter plume of the former battery factory were also elevated, averaging 500–550 ppm. EPA believes these elevated levels resulted from contamination from leaded gasoline, lead-based paint, and other anthropogenic sources.

#### **3.2 Investigation of Potential Health Risks**

Despite the soil sampling and plans for cleanup at the park and elementary school, community members continued to be concerned about potential health risks from soil contamination from the former battery factory. One community activist organization in particular, the African American Development Association, demanded attention to health problems of the Elmhurst neighborhood and further investigation of health effects from the contamination at Verdese Carter Park.

In response to these concerns, the Alameda County Lead Poisoning Prevention Program, in coordination with the Agency for Toxic Substances and Disease Registry (ATSDR), organized a blood lead screening event at the elementary school in the fall of 1993. Nine out of 628 young children tested in September 1993 had elevated levels of lead in their blood and were referred to the Alameda County Lead Poisoning Prevention Program for case management, environmental investigations, and remediation services. All but one of the homes of children with elevated blood-lead levels had elevated environmental levels of lead in soil or paint. The Alameda County Lead Poisoning Prevention Program concluded that home environments were probably the primary source of the elevated blood lead levels.

#### **3.3 Involvement of the EPA**

In the fall of 1994, the African American Development Association petitioned the EPA to re-evaluate health effects from the Verdese Carter Park contamination among the community. EPA investigated the contamination in the Verdese Carter Park area and, instead of listing the site on the Superfund National Priorities List, decided to negotiate with AlliedSignal, the potentially responsible party that had owned the battery factory, to conduct a voluntary remediation of residential properties near the park. At the time, this approach was known as the Superfund Accelerated Cleanup Model.

EPA oversaw two phases of sampling at residential yards near Verdese Carter Park in 1995–96 and again in 1998–99. When EPA first sampled soils at residences, it screened the properties to determine from a few samples on each property whether average lead concentrations were generally high (above 1,000 or 2,000 parts per million) or were generally low (less than 500 ppm). Most of this sampling was done using an XRF (X-Ray Fluorescence) machine. EPA sent some of the XRF samples to a laboratory for testing to validate the results, and found the XRF analysis for lead to be generally consistent with the lab results.

EPA determined which properties to sample initially based on air dispersion modeling of smelter emissions from the former battery factory.

Several years later, after EPA had negotiated with AlliedSignal to voluntarily remediate residences with lead concentrations above 1,000 ppm, AlliedSignal conducted another round of sampling at properties that had lower concentrations. It collected samples at about 10 locations on each property to further assess and delineate soil lead hazards near the park and to characterize the likely extent of lead contamination from emissions of the battery factory. AlliedSignal agreed to remove soil at residential yards that had lead soil concentrations above area background levels and therefore may have been contaminated from the former battery factory. In addition, as part of its lead hazard assessment and abatement services, the ACLPPP conducted its own environmental investigations at over one hundred residences near the park. These investigations focused on hazards from lead-based paint and included soil testing, even at sites the EPA or PRP had already tested.

### Sampling Results

According to these sampling efforts, residential properties down grade of the former battery factory had the highest levels of lead contamination due to runoff from the factory and lead-based paint from home exteriors. Lead concentrations at other properties near the park depended on smelter emissions, the prevailing wind direction, and non-smelter anthropogenic sources of lead such as lead-based paint and leaded gasoline. Residential soil concentrations of lead in the seven-block area adjacent to Verdesse Carter Park ranged from less than 50 ppm to 4,800 ppm. Many of the residences with high concentrations of lead in soil also had lead in paint. In EPA's initial sampling of over 100 residential yards, 28 yards had lead soil concentrations above 1,000 ppm.

## **4.0 Protective Measures**

### **4.1 Selection of Protective Measures**

Several agencies and organizations have been involved in the selection and implementation of protective measures in the Verdesse Carter Park community. The primary protective measures used in the Verdesse Carter Park area have been community education and outreach combined with soil removal and replacement. Other protective measures included physical barriers such as caps and fences used early on at the park and technical assistance and case management services provided to help residents reduce their exposure to lead. Protective measures considered, but not selected, included soil mixing and other options for on-site management and/or treatment of contaminated soil. EPA decided against these options due to concerns about their level of protectiveness and, for treatment and phytoremediation, their lack of demonstrated effectiveness.

### Verdesse Carter Park

The City of Oakland selected and implemented protective measures for the park site at two different times—first, in the mid-to-late 1970s, to clean up the former battery-factory site before constructing the park and a second time in 1993–94 to respond to residents' concerns about residual contamination on the property. The initial cleanup involved removal of 5,700 cubic yards of contaminated soil and on-site containment and capping of arsenic-containing rock with asphalt. Neither the City of Oakland nor Alameda County, however, monitored the protectiveness of the asphalt cap, which failed as cracks developed in it. The second cleanup involved the City closing and fencing the park after contamination was detected, and then removing an additional 17,000 cubic yards of lead-contaminated soil and arsenic-containing rock from the park before reopening it to the public.

### Residences near the Park

The Alameda County Lead Poisoning Prevention Program, in coordination with the Alameda County Public Health Department, the City of Oakland, EPA, ATSDR, and community representatives, developed a “Strategic Plan for Verdese Carter Park” in 1995. This plan outlined the protective measures to be implemented to reduce lead exposure in the Verdese Carter Park community, the roles of agencies and other organizations, and some of the funding sources for risk assessment and risk management activities. Based on the strategic plan, an interagency working group was established to coordinate activities to clean up the park, investigate and clean up contamination at residential properties, and conduct public education and community outreach. In addition, a Community Assistance Panel provided a community forum for discussing developments at the park.

More details about the protective measures used in the Verdese Carter Park area are discussed below.

## **4.2 Soil Removal and Replacement**

### Soil Removal at the Park and School

The City of Oakland removed a total of 32,700 cubic yards of lead-contaminated soil and arsenic-containing rock from the Verdese Carter Park site during voluntary cleanups in 1976–78 and 1994. The first removal did not remove all of the lead-contaminated soil from the site and left gravel containing naturally occurring arsenic on the site to be capped. For the second removal, the City, under joint oversight by EPA and the Alameda County Public Health Department, removed lead-contaminated soil on the property, brought in clean fill, and tested the soil to ensure that lead concentrations at the park were below 200 ppm, the level the County determined would be protective of human health. Lead-contaminated surface soils were also removed at the elementary school after elevated lead concentrations were found in soils there.

### Soil Removal at Residential Properties

Following the development of the strategic plan for the park, AlliedSignal funded and managed soil removal and replacement at residences near Verdese Carter Park under EPA oversight. Soil removal and replacement occurred in three phases. First, soils were removed at residential yards with lead concentrations in excess of 2,000 ppm. Second, soils were removed at residential yards with lead concentrations between 1,000 and 2,000 ppm. Third, soils were removed at residential yards with lead concentrations above area background levels (which averaged 500–550 ppm) that had not already been remediated.

EPA and AlliedSignal’s efforts to sample and remediate residential properties were complicated by the fact that many of the residents of the Verdese Carter Park neighborhood rented rather than owned their homes. Residents generally wanted the soil testing and remediation to be conducted on their properties; many property owners, however, refused to have soils on their properties tested and remediated. During the final phase of soil testing and remediation, EPA used its enforcement authority to gain access to properties where property owners did not live. At fewer than 10 residences where property owners lived, the property owners refused to have soils tested and remediated. In these cases, no soil remediation was conducted, and EPA sent the property owner a letter acknowledging that the property owner refused cleanup.

In total, AlliedSignal conducted soil removals at 23 residential properties with lead concentrations above 1,000 ppm during the first two phases and at 13 residential properties with lead concentrations above area background levels during the third phase. AlliedSignal removed up to two feet of soil at these 36 residential properties and cleaned up properties to a level of 500 ppm for lead, which EPA had determined

would be protective of human health.<sup>1</sup> Soil was removed six inches to one foot deep at a time and then sampled to determine whether concentrations were below 500 ppm; at most properties, a total of one to two feet of soil was removed.

### **4.3 Physical Barriers**

#### Capping at the Park

As part of its initial cleanup of the former battery factory site in the 1970s, the City of Oakland consolidated the arsenic-containing gravel on one portion of the property and covered it with an asphalt cap. This area was developed into a basketball court at Verdese Carter Park. The City Parks Department was supposed to do an annual inspection of the arsenic-capped areas and then report any cracks, crevices, or other problems to the County Health Department to take appropriate actions. This monitoring was not done, and it was residents' complaints about a yellow-white substance, a precipitate from the arsenic-containing rock, in the cracks at the basketball court that initiated additional soil testing and cleanup at the park.

#### Fence during Park Closure

The City of Oakland closed Verdese Carter Park from 1993 to 1996, while it investigated and removed contamination at the park. During this time, it fenced the park to keep residents out.

### **4.4 Education and Outreach**

The Alameda County Lead Poisoning Prevention Program, EPA, HUD, community representatives, and other agencies and organizations engaged in a multi-faceted education and outreach effort for the Verdese Carter Park community. Education and outreach occurred during all stages of cleanup, including assessment of the problem, selection of protective measures, and implementation.

#### Education and Outreach for Blood-Lead Screening

Among the first outreach activities conducted for the Verdese Carter Park area was a door-to-door outreach effort to residents in the neighborhood of the park about a blood-lead screening event for young children at the elementary school in 1993. The ACLPPP organized this lead screening in coordination with ATSDR. The following year, ACLPPP contracted with a community-based organization to coordinate a broader door-to-door education campaign in the Elmhurst District of Oakland, including the Verdese Carter Park area. Over a four-week period, 3,664 residents were directly contacted, provided education about lead hazards and individual protection measures, and encouraged to have their children screened for elevated blood-lead levels.

#### Education and Outreach for Soil Sampling and Removal

EPA initiated and coordinated a variety of education and outreach activities associated with soil testing and soil removal at residential properties near Verdese Carter Park. EPA hosted a series of community meetings about the Verdese Carter Park project, developed and distributed bilingual educational materials, and conducted door-to-door outreach to residents of properties adjacent to the park and within

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<sup>1</sup> The Alameda County Public Health Department and EPA Region 9 both used EPA's Integrated Exposure Uptake Biokinetic (IEUBK) Model to determine cleanup levels for lead in soil that would be protective of human health and the environment. Using different exposure assumptions, EPA Region 9 set the cleanup level for residential yards near Verdese Carter Park to be 500 ppm, while Alameda County used a cleanup level of 200 ppm for the park.

the former battery factory's smelter plume. During its outreach, EPA answered residents' and property owners' questions about sampling, disclosure, and soil removal; educated residents about health risks from lead exposure and ways to reduce exposure; and referred residents to the ACLPPP for interior lead-hazard reduction services. Education about individual protection measures included recommendations for remodeling homes, gardening on potentially contaminated soil, and describing health concerns to doctors.

#### Education and Outreach for Interior Lead Hazard Reduction

ACLPPP and HUD coordinated outreach to residents about risks from indoor lead exposure and interior lead-hazard abatement. At the same time EPA did its door-to-door outreach, a representative from HUD and a representative from ACLPPP jointly conducted one-on-one counseling with residents of over a hundred homes in the Elmhurst District. In addition, as part of the Strategic Plan for Verdesse Carter Park, the African American Development Association recruited a community block representative from each of the seven blocks surrounding the park. These representatives assisted ACLPPP in its outreach efforts by informing residents about cleanup activities, assisting in the identification of at-risk children (i.e., children under age 6 living in homes with the potential for lead exposure), distributing educational materials, and helping residents apply to ACLPPP for lead hazard reduction grants and loans. ACLPPP also hired one individual from the community part time to serve as community outreach contact for the entire seven-block area. This community leader canvassed the area multiple times, distributed educational materials such as lead-safe painting kits, recruited residents to apply for ACLPPP's lead hazard reduction services, and served as chair of the community assistance panel.

#### **4.5 Technical Assistance and Case Management Services**

In addition to blood-lead screening and education, ACLPPP conducted environmental risk assessments/paint assessments at residences and remediated residences with lead-based paint hazards. ACLPPP provided these services at residences where children known to have elevated blood-lead levels lived and at other residences when property owners applied for assistance. Specifically, ACLPPP offered up to \$10,000 (\$35,000 for multi-family units) in lead paint hazard reduction services free to property owners of homes within two blocks of Verdesse Carter Park that were built before 1978 and had children under age six living. Environmental evaluations of lead hazards included visual inspections of homes, XRF tests of paint surfaces, dust sampling, soil testing, and drinking water testing. Remediation techniques included exterior paint stabilization, replacement of windows and garage doors, some interior paint stabilization, and covering soil not already remediated by AlliedSignal with concrete, sod, wood chips, or river rock. ACLPPP has remediated more than 100 homes in the Verdesse Carter Park neighborhood. For owners of pre-1978 residential properties in Alameda County, ACLPPP also provided free services including lead testing and consultation, lead-safe painting and remodeling classes, lead-safe painting preparation kits, and HEPA vacuum cleaner loans.

EPA also provided a technical assistance grant to the community assistance panel, which used the grant to fund an independent review of cleanup reports.

### **5.0 Funding and Legal Authorities**

#### **5.1 Funding Sources and Mechanisms**

The City of Oakland paid more than \$3.7 million to close and fence the park, test the soils, and remove 17,000 cubic yards of soil and arsenic-containing rock from Verdesse Carter Park in 1993–94. AlliedSignal paid about \$5 million for soil removal and restoration at residential properties. EPA's costs for soil sampling, public outreach, and oversight of AlliedSignal's remediation activities were about \$2 million. EPA administered the cleanup through its Superfund Program even though Verdesse Carter Park was not listed as a National Priorities List site. Alameda County and ATSDR funded the initial outreach efforts and the blood-lead screening at the elementary school.

As outlined in a grant proposal, funding for the Strategic Plan for Verdes Carter Park for 1995-96 consisted of the following.

- \$135,349 for project coordination, training of community-based representatives, and staffing for the community assistance panel (paid for by EPA and ATSDR)
- \$70,587 for blood lead screening tests, data evaluation, and data input (paid for by ATSDR)
- \$373,958 for hazard remediation at 36 residential homes (paid for by ACLPPP)
- \$40,000 for a Cleaning Services Subsidy Fund to provide a service subsidy to a community-based contractor who performs lead specific cleaning (paid for by ACLPPP, except for \$5,000 in community co-payments)
- \$15,948 for a Capital Fund to provide equipment subsidies and an insurance subsidy to a community-based contractor for lead abatement (paid for by ACLPPP)

To continue funding ACLPPP's services, HUD provided a \$1.4 million grant to the ACLPPP for community education, outreach, and interior dust sampling, paint assessment, and lead hazard reduction at over 100 homes during 1998-2001. Alameda County committed over \$3.3 million in local matching funds for this grant, including \$2 million from AlliedSignal and a \$265,000 grant from the EPA as part of the Brownfields Economic Redevelopment Initiative. EPA also provided a \$215,000 grant to the ACLPPP to conduct interior and exterior sampling in homes near the park, evaluate the sampling results, and provide recommendations for possible mitigations in 1995-97.

## **5.2 Liability Protections**

As mentioned earlier, the cleanup of the Verdes Carter Park area was voluntary rather than legally mandated. To provide protection from liability under Superfund, the EPA issued Honeywell (formerly AlliedSignal) a "site close-out" letter in January 2001 that acknowledged that AlliedSignal had completed all the necessary response actions voluntarily and that the EPA intended to take no further actions in the Verdes Carter Park area.

## **6.0 Lessons Learned**

### **6.1 What Worked Well**

#### Community Involvement

Although initially there was considerable public outcry that the City of Oakland had built a park and a school on contaminated property, community engagement was one of the key success factors for cleanup activities in the Verdes Carter Park area. Coordinated outreach and education efforts of Alameda County, HUD, and EPA reached a large audience with information about risks of lead exposure, individual protection measures, and ongoing cleanup activities. Community members first drew attention to potential risks from contamination at the park and were an integral part of efforts to develop the Strategic Plan for Verdes Carter Park, encourage blood-lead screening for children, and reduce lead hazards at homes. The community outreach contact hired by ACLPPP was particularly effective at education and outreach to a community that was distrustful of government agencies.

#### Interagency Coordination

EPA, HUD, the ACLPPP, other government agencies, private organizations, and community representatives worked together to develop and implement a strategy for addressing lead hazards in the Verdes Carter Park community. This allowed the agencies to more efficiently use and leverage resources for problem assessment and cleanup.

### Voluntary Soil Remediation

AlliedSignal and the City of Oakland voluntarily cleaned up the park and residential yards with lead soil contamination under oversight of the EPA and the Alameda County Public Health Department without designating Verdese Carter Park as a Superfund site. This removed contamination from properties in a shorter time frame than would have been likely had the site been listed on the Superfund National Priorities List.

## **6.2 What Did Not Work Well**

### Monitoring of Engineered Controls

The City of Oakland failed to monitor the effectiveness of the cap covering the gravel with naturally occurring arsenic at the park from when it was installed in the 1970s to the time the park was remediated in the 1990s. No funds were established for monitoring, and the City Parks Department and Alameda County Public Health Department may not have been aware of their responsibilities to make sure the cap remained protective.

### Gaining Access to Properties

ACLPPP and the EPA frequently had difficulties gaining access to properties and homes for soil sampling, paint inspections, and other risk assessments. While residents of properties may have wanted soil sampling and hazard assessments to occur, property owners who did not live on the properties often did not. In addition, some residents were discouraged from accepting grants or loans from ACLPPP as part of a legal strategy in a suit against AlliedSignal. During the final phase of cleanup, EPA used its enforcement authority to gain access to properties where properties owners did not live.

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# **Institutional Frameworks Case Study**

## **Barber Orchard, Waynesville, North Carolina**

### **1.0 Introduction/Summary**

Barber Orchard is a 500-acre former apple orchard in western North Carolina that has been partially developed into residential housing. Past application of pesticides, spills in pesticide mixing areas, and leaks of an underground distribution system for pesticides have contaminated soils and ground water at the former orchard with a variety of chemicals, including lead, arsenic, and organic pesticides in soils and benzene hexachloride (BHC) in ground water. After a resident requested sampling of a private well in 1999, the State of North Carolina, and later Haywood County and the Environmental Protection Agency (EPA), sampled soils and ground water at the site. In response to potential health risks posed by historical pesticide contamination at Barber Orchard, EPA conducted emergency soil removal at 28 residences where arsenic levels exceeded 40 parts per million (ppm). The State of North Carolina and Haywood County recommended that residents filter their drinking water and take precautions to avoid exposure to contaminated soils. EPA completed the emergency removal action in August 2000 and listed the Barber Orchard site on the Superfund National Priorities List (NPL) in 2001. EPA is currently conducting a Remedial Investigation/Feasibility Study of the former orchard to determine what should be done to address the remaining contamination at the site, including areas that have not been developed into residential housing.

The remainder of this case study is organized as follows.

- Section 2 provides background on the site, the sources of contamination, key players, and a chronology of major milestones.
- Section 3 describes how contamination problems were identified and addressed.
- Section 4 discusses the protective measures that have been considered and selected to address the contamination.
- Section 5 outlines funding sources and legal authorities employed.
- Section 6 discusses lessons learned from problem assessment and the implementation of protective measures.
- Section 7 lists references consulted for the case study.

### **2.0 Background**

#### **2.1 Site Description**

Barber Orchard is an approximately 500-acre site located three miles west of Waynesville, North Carolina. The property is on a hillside with elevations ranging from about 3,000 feet along Richland Creek to more than 4,000 feet along U.S. highway 74. Barber Orchard operated as a commercial apple orchard from about 1908 to 1988, when the orchard went bankrupt. At that point, the property was sold to a developer, subdivided, and partially developed into residential housing. Apples are still grown on a portion of the property.

Most of the homes on Barber Orchard were built during 1993–94, but a large portion of the property remains undeveloped. There are about 90 homes and about 300 undeveloped lots in the housing subdivision. The lots range in size from less than an acre to more than 20 acres in size. For many of the residents, the homes at Barber Orchard are summer residences only.

## 2.2 Sources of Contamination

Because of its hillside location, the commercial orchard had an unusual distribution system for pesticides—a pressurized underground piping system delivered pesticides to various locations on the property, where orchard employees would connect a flexible hose and nozzle to the pipeline to apply the pesticides. Pesticides were stored in a packinghouse on the property and mixed in two 500-gallon concrete tanks in a central mixing area. The pesticide distribution system, which was buried at a depth of one foot, was routinely flushed to prevent clogging, and during winter months the pipes would rupture and freeze. Pesticides, fungicides, and rodenticides used at the orchard included lead arsenate, dichlorodiphenyltrichloroethane (DDT), dichlorodiphenyldichloroethane (DDD), benzene hexachloride (BHC), endrin, and dieldrin. Leakage of the pesticide distribution system, spills from mixing pesticides, and product application on apple trees have resulted in soil and ground water contamination on the property.

## 2.3 Key Players and Roles

Organizations involved in the assessment and remediation of contamination at Barber Orchard include the following.

- The Haywood County Health Department helped sample well water at Barber Orchard, hosted the first public meeting about the contamination, recommended individual protection measures for residents, assisted residents in studying the effectiveness of drinking water filters, is arranging for the Barber Orchard subdivision to be connected to a municipal water supply, and notifies property owners who are about to build on land at other former orchard areas about the potential for pesticide contamination.
- The North Carolina Department of Environment and Natural Resources (NCDENR) Division of Water Quality initially sampled water in private wells at Barber Orchard along with the Haywood County Health Department and notified the EPA about the contamination.
- The North Carolina Department of Agriculture and Consumer Affairs conducted the initial soil sampling at Barber Orchard.
- The North Carolina Department of Health and Human Services issued health advisories to residents after contamination was discovered.
- The Environmental Protection Agency Region 4 sampled soils and ground water at Barber Orchard after the State of North Carolina and Haywood County had conducted sampling earlier, hosted public meetings for local residents, conducted an emergency removal action for developed areas of existing residential properties, listed Barber Orchard on the Superfund NPL, and is developing a Remedial Investigation/Feasibility Study to determine whether and what kind of additional cleanup is needed at the site.
- The U.S. Agency for Toxic Substances and Disease Registry (ATSDR) conducted a Public Health Assessment for Barber Orchard after EPA completed its emergency removal action at Barber Orchard and proposed to list the site on the Superfund NPL.

## 2.4 Chronology of Major Milestones

III. Date	IV. Activity
1908–88	▪ Commercial apple orchard operates at Barber Orchard.
1988–89	▪ Orchard goes bankrupt; land is parceled off and sold for residential development.
1993–94	▪ Most of the homes in Barber Orchard subdivision are built.
1999	▪ Resident asks NCDENR Division of Water Quality to test well water, and organic pesticides are detected in the water in January.

	<ul style="list-style-type: none"> <li>▪ NCDENR Division of Water Quality and Haywood County sample 88 wells.</li> <li>▪ North Carolina Department of Agriculture and Consumer Affairs samples soils and finds elevated levels of arsenic, lead, and other pesticides.</li> <li>▪ EPA Region 4 collects soil and ground water samples, provides bottled water to one resident, and initiates a time-critical removal action in June.</li> </ul>
1999–2000	<ul style="list-style-type: none"> <li>▪ EPA removes 31,500 tons of arsenic-contaminated soil from 28 residential properties and replaces soil with clean fill.</li> </ul>
2001	<ul style="list-style-type: none"> <li>▪ EPA places Barber Orchard on Superfund National Priorities List.</li> <li>▪ EPA approves Work Plan for Remedial Investigation/Feasibility Study.</li> </ul>
2002	<ul style="list-style-type: none"> <li>▪ The Agency for Toxic Substances and Disease Registry releases Public Health Assessment for Barber Orchard for public comment.</li> </ul>

### 3.0 Problem Assessment

#### 3.1 Discovery of Contamination

In January 1999, on the advice of a former orchard worker, a resident of the Barber Orchard subdivision asked the North Carolina Department of Environment and Natural Resources (NCDENR) Division of Water Quality to test the resident's well water for the possible presence of pesticides. The NCDENR Division of Water Quality detected BHC in the water and notified the Haywood County Health Department that the State toxicologist would be evaluating the results. The State toxicologist recommended that the resident not drink the water but drink bottled water (which was not provided) instead. This recommendation initiated a larger sampling effort by the NCDENR Division of Water Quality and the County Health Department. Of the 88 wells these agencies sampled, 34 contained total BHC concentrations above the State standard of 0.019 parts per billion (ppb).

In addition to the ground-water sampling, the North Carolina Department of Agriculture and Consumer Affairs sampled the soils on 16 properties at Barber Orchard and found that concentrations of arsenic, lead, and some pesticides exceeded the State of North Carolina Inactive Hazardous Sites Program's soil remediation goals (400 parts ppm for lead and 4.4 ppm for arsenic).

#### 3.2 Further Investigation of Soil and Ground-Water Contamination

The State of North Carolina forwarded the results of the ground water and soil sampling to EPA Region 4, which initiated another sampling effort at Barber Orchard in June of 1999. The Region 4 Science and Ecosystem Support Division collected soil samples from 55 properties (53 of which were residential) and ground-water samples from 55 private wells at Barber Orchard. EPA found arsenic soil concentrations above 20 ppm at 35 properties; of those properties, 25 had arsenic concentrations above 40 ppm. EPA Region 4 established an emergency response level of 40 ppm of arsenic in soil for developed residential areas at Barber Orchard.<sup>2</sup> The 40-ppm standard for arsenic was based on a cancer risk of 10<sup>-4</sup>. In addition, 21 of the wells sampled had concentrations of BHC and other pesticides that exceeded EPA health-based benchmarks. Neither arsenic nor lead was detected in ground water.

To address potential health risks from this contamination, EPA initiated an emergency removal action at Barber Orchard in 1999 and listed the site on the Superfund National Priorities List in 2001 to address contaminant levels in residential areas that were above health-based standards but below EPA Region 4's emergency response levels (protective measures used at Barber Orchard are discussed below). EPA is currently conducting additional sampling at Barber Orchard as part of a Remedial

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<sup>2</sup> The emergency response level is based on the potential for imminent and substantial threat to human health or the environment. EPA Region 4 calculates the emergency response level on a site-specific basis, but has often used 40 ppm as the emergency response level for arsenic in residential areas.

Investigation/Feasibility Study (RI/FS) for the site. The following table summarizes initial soil sampling results for arsenic and lead, which are among the contaminants of concern at Barber Orchard, and associated cleanup levels for the site.

**Arsenic and Lead Soil Concentrations and Cleanup Levels at Barber Orchard**

<b>Contaminant</b>	<b>Concentration Range (ppm)</b>	<b>Frequency of Detection / Total</b>	<b>EPA Region 4 Emergency Response Level (ppm)</b>	<b>EPA Remedial Level (ppm)</b>	<b>NC Soil Remediation Goal (ppm)</b>
Arsenic	ND* – 1,340	210 / 273	40	20	4.4
Lead	ND* – 3,090	273 / 273	400	400	400

\*Not detectable. Since there were hot spots of arsenic and lead concentrations all over the former orchard, EPA and ATSDR have not been using average concentrations to evaluate potential health risks.

### **3.3 Public Health Assessment**

After EPA proposed listing Barber Orchard on the National Priorities List, the Agency for Toxic Substances and Disease Registry (ATSDR) prepared a draft Public Health Assessment for Barber Orchard, which it released for public comment in April 2002. As part of this health assessment, which occurred *after* EPA conducted its emergency removal action at Barber Orchard, ATSDR sampled the urine and blood of residents living at 29 properties that had previously had high levels of arsenic and lead in soil and observed no health effects. In the draft Public Health Assessment, ATSDR concludes, “current exposures to site contaminants are not likely to result in adverse health effects,” but reports that, in the past, residents who drank well water with the highest levels of pesticides and children who were exposed to soil with the highest levels of arsenic and lead may have increased their risk of adverse health effects. ATSDR’s conclusions about current health risks to Barber Orchard take into account that residents are filtering their water to remove contaminants and that EPA has cleaned up frequently used areas of residential yards that had higher levels of arsenic and lead.

## **4.0 Protective Measures**

### **4.1 Selection of Protective Measures**

Since pesticide contamination was detected at Barber Orchard, the EPA and Haywood County have taken several short-term precautions to reduce contaminant levels and control exposures. They are now developing long-term strategies for protecting human health and the environment at the site. EPA has provided bottled water to one residence, conducted an emergency soil removal at the developed areas of 28 residential properties, and listed Barber Orchard on the National Priorities List so that the site will be further investigated and remediated. The Haywood County Health Department has focused instead on informing current and future residents about pesticide contamination and the risks of exposure, encouraging residents to use water filters for private wells and to test soils at new developments, and connecting Barber Orchard to a municipal water supply.

For the Remedial Investigation/Feasibility Study (RI/FS), EPA will be collecting samples from soil, sediment, ground water, and surface water at Barber Orchard to more fully characterize the nature and extent of contamination, focusing on areas not sampled during the emergency soil removal. Alternatives for remediating soil and ground-water contamination at Barber Orchard—including alternatives to reduce the toxicity, mobility, or volume of waste; containment with little or no treatment, and a no-action alternative—will also be analyzed and screened. EPA expects the RI/FS to be completed by June 2002 and the Record of Decision to be issued for Barber Orchard by December 2002.

Details about protective measures used and planned at Barber Orchard are discussed below.

## **4.2 Removal of Contaminants**

### **Soil Removal and Replacement**

When EPA detected concentrations of arsenic in soil above 40 ppm—EPA Region 4’s site-specific short-term exposure cleanup criterion—it initiated an emergency removal action at Barber Orchard. From September 1999 to August 2000, EPA Region 4’s Emergency Response and Removal Branch excavated the top foot of soil from the yards of 28 residential properties where residents currently lived. In the emergency response, EPA only excavated and replaced contaminated soil from the developed areas of the residential yards (e.g., where grass was established) not the entire properties. In addition, EPA removed and replaced soil at a former pesticide mixing area. Because higher lead levels were associated with areas of higher arsenic levels at Barber Orchard, the emergency removal for arsenic soil contamination also addressed short-term risks from exposure to lead-contaminated soil. The emergency soil removal involved excavating, transporting, and disposing 31,500 tons of contaminated soil to a landfill in Georgia, replacing the contaminated soil with clean soil, and seeding the new soils at residences.

### **Drinking Water Protections**

When EPA found lindane (gamma-BHC) levels in one well that exceeded EPA Region 4’s removal action limit of 2 ppb, it provided the residence with bottled water. After initially recommending that residents not cook or drink water from private wells, the Haywood County Health Department recommended that residents use carbon filters to remove contaminants from well water and test the water every six months to ensure that filters continue to operate properly. Most residents have installed at least a paper filter for their water. As a long-term strategy, Haywood County is installing a 3.5-mile water line with two pump stations and holding tanks to serve current and future residents of Barber Orchard. After it is installed, the Town of Waynesville will take over ownership of the first 2.5 miles of the water line and the County will own the last mile and the pump stations.

## **4.3 Education and Outreach**

### **Public Notices and Public Meetings**

While the initial sampling was occurring, the Haywood County Health Department and the North Carolina Department of Health and Human Services notified Barber Orchard residents of potential health risks and recommended that residents avoid contact with soil around their homes and not use water from private wells for drinking or cooking without filtering it first. In addition to issuing public notices, the Haywood County Health Department distributed ATSDR fact sheets to residents about arsenic, lead, and other chemicals of concern at Barber Orchard and hosted a public meeting for residents after the County and the NCDENR Division of Water Quality had sampled about 20 private wells. Since that initial outreach, EPA has led the education and outreach activities for Barber Orchard, including hosting about 8-10 additional public meetings to inform residents and answer questions about sampling and cleanup activities. Initial public meetings were well attended and received considerable media attention, but few people attend public meetings now that the emergency removal action has been completed.

### **Notification to Property Owners Applying for Permits**

For future homes built on former orchard land (including Barber Orchard and other orchards in Haywood County), Haywood County notifies property owners who apply to the County for improvement permits for septic tanks (when the County first gets involved in the development process) that there may be pesticide residues on their properties and that they may want to have their soils and ground water tested. Since homes located more than a mile outside of cities need septic tanks, this means that, in effect,

Haywood County is able to notify all property owners who are about to build on land (but not people about to buy land<sup>3</sup>) at former orchards about the potential for pesticide contamination.

#### **4.4 Other Protective Measures Being Considered**

As mentioned earlier, EPA is currently conducting a Remedial Investigation/Feasibility Study to determine long-term remedies for the remaining contamination in developed and undeveloped areas of the Barber Orchard site. EPA expects that these protective measures probably will include the removal of the underground piping system used to distribute pesticides and some type of land-use control to ensure that undeveloped areas with particularly high contamination levels do not become used for residential housing.

### **5.0 Funding and Legal Authorities**

#### **5.1 Funding Sources and Mechanisms**

EPA, the State of North Carolina, and Haywood County have shared the costs for soil and ground-water sampling, public meetings, and community outreach activities at Barber Orchard.

EPA's costs for the emergency removal action—including investigation sampling, cleanup costs, personnel, travel, and other charges—totaled roughly \$5.8 million. Of that total, EPA paid \$3.7 million to a cleanup contractor for removing, disposing of, and replacing contaminated soil in residential yards. For the ongoing remedial investigation and feasibility study (RI/FS), EPA will pay about \$980,000. EPA estimates that the total cost of remedial action at the Barber Orchard site will be \$10 million, of which the State of North Carolina is required to pay 10 percent. EPA's funding is from the Superfund Trust fund, and EPA has made a commitment that it will not ask for reimbursement from any homeowners at Barber Orchard.

Property owners pay for any water filters and/or additional testing or monitoring of their drinking water.

The 3.5-mile water line with pump stations and holding tanks that Haywood County is building to serve Barber Orchard residents is a \$2.5–3 million project paid largely through grants. NCDENR provided the majority of the money for the project in a \$1.6 million grant to Haywood County, while EPA and the North Carolina Rural Economic Development gave the County grants of \$475,000 and \$350,000 respectively.

#### **5.2 Legal Authorities**

EPA's authority is derived from the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or Superfund) and the Superfund Amendments and Reauthorization Act (SARA). EPA Region 4 conducted the emergency soil removal at Barber Orchard as a short-term cleanup to address contamination that posed an "imminent and substantial threat" to human health or the environment. Barber Orchard is one of the first orchard sites EPA has listed on the Superfund National Priorities List, because EPA has a general policy against listing sites with contamination resulting solely from the legal application of pesticides. EPA's policy under CERCLA is to list pesticide contamination only if it can be attributed to leaks, spills, or improper disposal. In addition, EPA may initiate CERCLA removal activities, such as providing alternate water supplies, if it determines that the release or threat of release constitutes a public health or environmental emergency and no other party has the authority or capability to respond in a timely manner.

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<sup>3</sup> No government agency or private institution in Haywood County currently provides notification at the time of purchase about the potential for pesticide contamination.

EPA Region 4's rationale in listing Barber Orchard on the NPL was to address health concerns of residents who had contaminant levels in their well water that exceeded the maximum contaminant levels of the Safe Drinking Water Act, but were below EPA Region 4's emergency response levels for the site. According to the EPA project manager for Barber Orchard, no other orchard sites have been brought to EPA Region 4 for consideration for the Superfund NPL and EPA Region 4 has no current plans to investigate former orchards other than Barber Orchard.

## **6.0 Lessons Learned**

There has been a relatively short history of investigation and cleanup at Barber Orchard since contamination was first discovered in 1999. Only a portion of the former orchard has been remediated, largely through EPA's emergency removal in 1999–2000, and EPA has yet to issue a Record of Decision outlining plans for the final remediation of the Barber Orchard site. As such, the following are preliminary lessons learned from the first stage of cleanup at the site.

### **6.1 What Worked Well**

#### Providing Information to Residents after Discovery of Contamination

After contamination was discovered, Haywood County, the State of North Carolina, and EPA provided information to Barber Orchard residents about contamination levels, potential health risks, and cleanup activities through a series of public meetings, fact sheets, and public notices. Residents found information that put the risks into perspective particularly helpful. EPA is continuing public outreach and education as part of developing the RI/FS for Barber Orchard. Haywood County also continues to notify property owners when they apply for septic tank permits about the potential for pesticide contamination.

#### Cooperation of Property Owners Regarding Drinking Water Filters

Property owners cooperated with the Haywood County Health Department in testing and using carbon filters to remove contaminants from well water. The County's testing of the effectiveness of the filters, which were shown to be effective, did a great deal to relieve people's anxiety. Most property owners at Barber Orchard have purchased and now use water filters for their wells.

### **6.2 What Did Not Work Well (or Challenges Being Faced)**

#### Reaction of Lending Institutions

After contamination was discovered at the Barber Orchard subdivision and Haywood County held the first public meeting about it, local lending institutions would not give out a mortgage or second mortgage for properties at Barber Orchard and appraisers refused to appraise properties. For an almost two-year period, property sales at Barber Orchard could not go forward because of the refusal of local lending institutions to provide mortgages for the properties. Local lending institutions have reconsidered the informal moratorium they placed on mortgages, particularly since there have been people from other states willing to buy properties at Barber Orchard despite the contamination and cleanup activities. Some of the lending institutions have now abandoned the informal moratorium and again provide mortgages for homes at Barber Orchard.

#### Unclear Effects on Property Values

It is unclear how the discovery of contamination at Barber Orchard, the EPA's emergency cleanup activities, and the listing of the Barber Orchard site on the NPL have affected property values. Property owners at Barber Orchard requested that the County Tax Assessor's Office reduce the assessed values of properties for property tax purposes because of the contamination found at Barber Orchard and the Superfund NPL listing, but the County has not taken action on those requests. There have been sales of both homes and undeveloped properties at Barber Orchard since contamination was discovered in 1999; initially, however, Barber Orchard properties on the market were not selling due to the refusal of lending institutions to provide mortgages. A few local real estate agents apparently will not sell properties at

Barber Orchard, but most agents are willing to disclose information about the contamination and cleanup activities to prospective buyers and proceed with the property sales.

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# **Institutional Frameworks Case Study**

## **Bunker Hill Superfund Site, Idaho**

### **1.0 Introduction/Summary**

The Bunker Hill Superfund Site is a former mining and metal smelting area located in Shoshone County in the panhandle of northern Idaho. The site has been used for mining and metallurgy since the 1880s. In 1983, the site was placed on the National Priorities List (NPL) for Superfund cleanup due to the presence of lead, arsenic, cadmium, zinc, and other heavy metals. Environmental and health monitoring data show significant levels of soil contamination, ground water contamination, and elevated levels of blood lead in area children. Since the NPL listing, remedial actions have been selected for both populated and non-populated areas of the site. To address exposure risks from soil contamination in populated areas of Bunker Hill, the Panhandle Health District administers, monitors, and enforces a multitude of institutional protection measures, while the Environmental Protection Agency (EPA) and potentially responsible parties have implemented physical protection measures including soil and household dust removal, revegetation, and installation of caps and barriers. Institutional protection measures used at Bunker Hill include locally enforced rules and regulations to ensure the integrity of clean soil and other protective barriers placed over contaminants, education and technical assistance to property owners for small projects and interior renovations, permit requirements and inspections for large projects, and licensing of contractors involved in soil excavation and other activities.

The remainder of this case study is organized as follows.

- Section 2 provides background on the site, the sources of contamination, key players, and a chronology of major milestones.
- Section 3 describes how contamination problems were identified and addressed.
- Section 4 discusses the protective measures that have been considered and selected to address the contamination.
- Section 5 outlines funding sources and legal authorities employed.
- Section 6 discusses lessons learned from problem assessment and the implementation of protective measures.
- Section 7 lists references consulted for the case study.

### **2.0 Background**

#### **2.1 Site Description**

The Bunker Hill Superfund site is 21 square miles and includes former mining and smelting facilities located along I-90 in the Silver Valley, in Shoshone County in the panhandle of northern Idaho. The Coeur D'Alene River and several of its tributaries run through the site. The site encompasses the four incorporated communities of Pinehurst, Smelterville, Wardner, Kellogg, and Page, as well as the three unincorporated communities of Ross Ranch, Elizabeth Park, and Montgomery Gulch. The total population of those living within the site is roughly 6,000 people.

Specific industrial operations in the site have included the Bunker Hill Mining and Metallurgical complex, the Bunker mine, a concentrator, a lead smelter, an electrolytic zinc plant, a phosphoric acid and fertilizer plant, a cadmium plant, a number of mills, and sulfuric acid plants. Area mining and mill operations began in the 1880s and continued until 1991. Area smelting operations began in 1917 and continued until 1981. The mines and smelters produced lead, cadmium, zinc, silver, gold, and other alloys of heavy metals.

In addition to the mining and smelting operations, historic land uses have included residential and some commercial uses.

For purposes of investigation and development of protective measures, the Bunker Hill Superfund site has been divided into four parts: 1) the populated area, which includes residential and commercial properties, rights of way, and public use areas; 2) the non-populated area, which includes the smelter complex, tailings impoundments, surrounding hills, groundwater, sediments and surface water, dust, and adjacent commercial properties; 3) the long-term management of acid mine drainage (AMD); and 4) the mining-related contamination in the broader Coeur d'Alene River Basin. This case study primarily focuses on the first, the populated area, which comprises roughly 10% of the total 21-square mile site.

In 1982 the site was proposed for the National Priorities List under the federal Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), better known as Superfund. After the site was added to the NPL in 1983, EPA and the State of Idaho began further investigating the nature and extent of the contamination throughout the Bunker Hill Superfund site.

## **2.2 Sources of Contamination**

The primary contaminants of concern at the Bunker Hill Superfund site are lead, arsenic, cadmium, zinc, and other heavy metals. The primary environmental media affected by contamination are soils, surface waters, and groundwater.

Historic discharges of wastes from mining and milling operations dispersed lead, arsenic, cadmium, zinc, and other heavy metals throughout the Coeur D'Alene River Basin. Dispersion primarily occurred through deposition of airborne particulates (from smelter stacks), alluvial depositions of tailings dumped in the river, and migration from other sources on the active mining and metal smelting site. Several thousands of tons of mill tailing, mine waste rock, and ore concentrates are spread throughout the basin.

In 1973, a fire destroyed the smelter bag house, a primary component of the smelter's air pollution control system. In a one-year period following the fire, over 1,000 tons of particulate lead were released into the air and settled on surrounding soils, destroying large areas of vegetation.

## **2.3 Key Players and Roles**

- United States Environmental Protection Agency (EPA) – has been the lead agency overseeing cleanup under Superfund, through its Region 10 offices.
- Centers for Disease Control (CDC) – was involved in the early health studies and establishing the Lead Health Intervention Program.
- Idaho Department of Environmental Quality (ID DEQ) – oversees the cleanup work of the potentially responsible parties and works in cooperation with EPA.
- Idaho Department of Health and Welfare (IDHW) – was involved in the early health studies.
- Panhandle Health District (PHD) – oversees and runs the Institutional Controls Program.
- Upstream Mining Group, a group of mining companies that are potentially responsible parties (PRPs) including Sunshine, Hecla, and Asarco – are conducting sampling and soil removal in residential yards and commercial areas and helping pay for the cleanup.

### Chronology of Major Milestones

V. Year	VI. Activity
1880s	Mining operations began
1917	Smelting operations began
1973	Bag house fire released lead particulates in air emissions
1974	Elevated lead blood levels detected in children
1981	Smelter shut down
1983	Site listed on NPL
1985	Lead Health Intervention Program initiated by CDC and Agency for Toxic Substances and Disease Registry (ATSDR)
1985-1987	Remedial Investigation/Feasibility Study (RI/FS) conducted for populated and non-populated areas
1986	Emergency removal of soil from public areas (parks and schools)
1989	Residential yard cleanup begun
1991	Record of Decision (ROD) signed for populated areas
1992	ROD signed for non-populated areas
1994-1996	Smelter buildings and stacks demolished
1996	ROD Amendment for non-populated areas
1997	South Fork of Coeur D'Alene River diverted for tailings removal
1998	1,400 residential yards cleaned up, soil removed from Smelterville flats, and hydroseeding revegetation of hillsides begun
1998	RI/FS initiated to address long-term management of acid mine drainage, and mining-related contamination of the greater Coeur d'Alene River Basin
1999-2000	5-year reviews of populated and non-populated areas

### **3.0 Problem Assessment**

The Bunker Hill Superfund site has been extensively studied by State and Federal agencies over the past 20 years. Although elevated levels of lead and zinc in the Coeur D'Alene River and adjoining wetlands may be affecting migratory waterfowl and aquatic organisms, including native fish species, the primary driver for site investigation and remediation has been public health concerns associated with soil and household dust contamination.

### 3.1 First Public Health Study

After the bag house fire in 1973, the local public became concerned about the effects of air pollution on human health. In 1974, a public health study was launched, as well as concurrent epidemiological and environmental investigations. The study was conducted by the Centers for Disease Control, the Idaho Department of Health and Welfare, and Panhandle Health District. The study included soil and household dust sampling and analysis. As well, blood lead levels were tested in children ages one through nine. The soil samples taken included the upper 1-inch of soil.

The findings of the 1974 investigations were as follows.

<b>Contaminant and Medium</b>	<b>Range</b>	<b>Averages</b>	<b>Federal Action Level</b>
Residential Lead Soil Concentrations	35 to 24,600 parts per million (ppm)	Kellogg 3073 Pinehurst 1169 Smelterville 7386 Page 3609 Wardner 4863 ppm	1000 ppm
Household Dust Lead Concentrations	940 to 26,700 ppm	Kellogg 8316 Pinehurst 2317 Smelterville 11,997 Wardner 5318 ppm	1000 ppm
Blood Lead Levels	11 to 164 microgram per deciliter (µg/dl)	Kellogg 49.6 Pinehurst 34.9 Smelterville 68.1 Page 48.7 Wardner 42.9 µg/dl	10 µg/dl (Remedial Action Objective of less than 5% of children with blood lead levels of 10 µg/dl or greater)

The epidemiological and environmental investigations concluded that atmospheric emissions of particulate lead were the primary source of elevated blood lead levels in local children.

These findings lead to EPA's first involvement on the site. In 1977, the U.S. Environmental Protection Agency ordered Gulf Resources and Chemical Corporation, the smelter operators at the time, to install sulfur dioxide pollution control equipment in the stacks.

### 3.2 Lead Health Study

The IDHW developed soil-sampling protocols as part of its 1983 Lead Health Study. Two surface soil samples (top 1-inch) were taken from each residence, one from the front and one from the back yard of each property. These samples were composited into a single sample for laboratory analysis.

The early health studies primarily focused on the health impacts for children, as exposures to lead are known to affect learning and cognitive development in children. As such, testing focused on households with children present.

The findings of the 1983 Lead Health Study were as follows.

<b>Contaminant and Medium</b>	<b>Range</b>	<b>Averages</b>	<b>Federal Action Level</b>
Lead Soil Concentrations	83 to 41200 ppm	Pinehurst 814 Smelterville 6231 ppm	1000 ppm
Household Dust Lead Concentrations	53 to 20700 ppm	Pinehurst 590 Smelterville 4734 ppm	1000 ppm
Blood Lead Levels	1 to 45 µg/dl	Pinehurst 12.2 Smelterville 21.4 µg/dl	<5% children at 10 µg/dl (Remedial Action Objective)

Perhaps because the 1983 Lead Health Study was conducted after the smelter had been closed, blood lead levels in children showed a significant drop off. However, the average levels were still considerably higher than levels considered by the federal government to be protective of human health.

As a result of the findings of this Lead Health Study, the CDC initiated a Lead Health Intervention Program, which included ongoing blood lead monitoring for children and educational information about things that residents could do to reduce household exposures to lead. This lead health program was initiated prior to the Records of Decision (ROD) under Superfund, signed in 1991 and 1992. However, the activities of this program were later incorporated into the 1992 ROD. The PHD currently runs the blood lead monitoring program and education program.

### **3.3 RI/FS Studies**

As a result of the site being placed on the Superfund NPL list in 1983, two phases of Remedial Investigation/Feasibility Studies (RI/FS) were conducted in the mid-to-late 1980s. The RI/FS included sampling of soil, house dust, groundwater, and surface waters. During 1985-1987, Phase I sampling occurred in Smelterville, Kellogg, Wardner, and Page. In 1989, Phase II RI/FS sampling occurred in Pinehurst and Elizabeth Park.

Sampling in the populated areas has focused primarily on contamination in residential yard soils and household dust. In general, soil samples collected during phase I and II of the RI/FS were analyzed for pH and the following 12 metals: antimony, arsenic, beryllium, cadmium, cobalt, copper, lead, mercury, nickel, selenium, silver, and zinc. The samples were collected to a depth of 18 inches below ground surface to determine the depth of remediation at residential properties. Sample intervals included 0-1", 1-6", 6-12", and 12-18". One sample was taken per 500 square feet, with a minimum of two sample locations per property.

The Residential House Dust Survey analyzed the contents of vacuum cleaner bags furnished by residents for lead. Dust sampled from vacuumed homes is intended to monitor exposures to dust for a community (by averaging among many homes). Since 1996, house dust samples have included samples taken from special floor mats placed at the entries of homes, in addition to the vacuum bag sampling. The floor mat sampling provides information on dust loading and lead loading rates (or the rates of dust and lead entering a home), in addition to measuring the concentration of lead in house dust.

Results of the 1985-1989 Phase I and II RI/FS under Superfund showed residential soil and household dust concentrations to be higher than is considered protective of human health. The lead levels initiated an EPA emergency removal of soil from public areas (parks and schools) in 1986 and the beginning of the residential yard cleanup in 1989. The results of the RI/FS have also lead to the development of the Record of Decision for the populated areas, which was signed in 1991. The 1991 populated area ROD focuses on excavating contaminated soil and sod and replacing it with clean soil.

<b>Contaminant and Medium (1989 data)</b>	<b>Range</b>	<b>Averages</b>	<b>Federal Action Level</b>
Lead Soil Concentrations	53 to 9230 ppm	Kellogg 2846 Smelterville 2975 Page 1156 Wardner 1304	1000 ppm
Household Dust Lead Concentrations	69 to 52,700 ppm	Kellogg 4568 Smelterville 1628 Page 794 Wardner 610	1000 ppm
Blood Lead Levels	3 to 41 µg/dl	Kellogg 10.8 Smelterville 14.6 Page 12.5 Wardner 11.8 µg/dl	<5% children at 10 µg/dl (Remedial Action Objective)

Sampling in the non-populated areas included soils, surface water, and ground water. Surface water sampling has been conducted since 1987 at thirteen different locations throughout the Bunker Hill Superfund site. Contaminants of concern include arsenic, cadmium, lead, and zinc. Since 1988, ground water sampling has occurred at 51 wells. Contaminants of concern are also arsenic, cadmium, lead, and zinc.

Levels of contamination found in the surface water and groundwater were in excess of Clean Water Act Standards and Safe Drinking Water Act Standards and contributed to the development of the 1992 ROD for the non-populated areas. Chemical-specific groundwater cleanup levels were based on Safe Drinking Water Act and state standards and include: arsenic .05 milligrams per liter (mg/l); cadmium .005 mg/l; lead .05 mg/l; and zinc 58 mg/l. The chemical specific surface water quality cleanup levels were based on the Clean Water Act standards and include: cadmium .0011 mg/l lead .0032 mg/l; and zinc .11 mg/l. Institutional protection measures in the form of land use restrictions and other administrative restrictions were identified for those populated and non-populated areas where onsite lead concentrations exceed 100 ppm.

In 1998, a RI/FS was initiated for the third cleanup area at the Bunker Hill Superfund site, the long-term management of acid mine drainage (AMD) from the Bunker Hill Mine. Also in 1998, EPA initiated a RI/FS for the fourth cleanup area to address mining-related contamination in the greater Coeur d'Alene River Basin.

## **4.0 Protective Measures**

### **4.1 Approaches Considered**

EPA Region 10 has been the lead authority for Cleanup at Bunker Hill under Superfund. Approaches considered for cleanup of the populated area included total soil removal, treatment in place, partial soil removal, and no action. Total soil removal was considered too expensive. The “no action” alternative was not considered to be protective of human health and the environment. Treatment in place was not considered technologically feasible. Thus, partial soil removal was selected, as discussed below.

## **4.2 Approaches Selected**

The following section describes the protective measures contained in the RODs of 1991 and 1992. Remediation of the Bunker Hill Superfund site has involved a combination of soil removal and other physical protection measures, institutional protection measures, and individual protection measures. Each element of the remediation is implemented by a number of different government agencies and other organizations and funded through different sources, and is described in more detail below.

### **4.2.1 Physical Protection Measures**

In the populated area, the physical protection measures have largely included the removal and replacement of contaminated soil in residential yards, public areas, and rights-of-way. Exposure to lead in residential solids was identified as the primary health risk to children and pregnant women within the populated areas of the site.

As mentioned above, EPA cleaned up some city parks and school playgrounds in 1986 as part of a CERCLA removal action. The yard soil removal program was initiated in 1989 as a CERCLA time-critical removal action to replace contaminated soils in yards of homes where young children at highest risk of lead poisoning lived. After the signing of the 1991 ROD for populated areas, the yard cleanup program has focused on removal of soil from all residential yards where lead contamination is in excess of 1,000 ppm and replacement with clean soil and sod. If contamination was detected in the 6-12" sampling interval, then soils was removed to 12 inches. If contamination was detected in the 12-18" interval, then soil was removed to a minimum of 18" and a visible barrier was installed. Clean soil was used as backfill.

The 1,000-ppm action level was selected based on site-specific analyses of the relationship between observed blood lead levels among children and environmental media lead concentrations at the site. The first use of what later became known as the EPA Integrated Exposure Uptake Bio-kinetic Model for lead in formulating cleanup criteria for lead in soils and dust was for the Bunker Hill Superfund Site. The performance goal for the soil and sod excavations and replacement with clean materials is resulting mean soil lead concentrations in residential areas of approximately 200 to 300 ppm.

Prior to 1994, and following EPA's emergency removal action, EPA and the Panhandle Health Districted conducted the residential soil removals. Since 1994, the yard soil removal program has been implemented by the Upstream Mining Group—a group of mining companies that are potentially responsible parties including Sunshine, Hecla, and Asarco—pursuant to the 1991 populated area ROD and 1994 signed Consent Decree. The Upstream Mining Group and other parties are scheduled to remediate 200 residential yards each year until all yards, commercial properties, and rights-of-way in the populated area with lead-contaminated soils greater than or equal to 1,000 ppm have been remediated. To date, soil has been removed from over 1,500 residential yards. Completion of remedial activities in the populated area is expected by 2003 and will include roughly 2,000 yards. The Idaho Department of Environmental Quality provides the primary oversight for the Upstream Mining Group's remediation of residential yards.

In addition to removal and replacement of contaminated surface soil and sod, the selected remedy in the 1991 populated area ROD includes the following:

- Disposal of contaminated materials at an onsite repository
- Revegetation of yards
- Dust suppression during remediation
- Institutional protection measures for barrier management
- Long-term environmental monitoring for evaluation of remedial effectiveness

All but the last two items in the remedy are provided by the PRPs. The last two are included as part of the Institutional Control Program of the Panhandle Health District, described in further detail below.

The 1991 ROD did not address the removal of household dust, however yard soil is considered to be a source of metal-contaminated dust in home interiors, and thus the ROD addressed the removal of a source of contaminated dust. House dust was covered under the 1992 ROD. Remedial measures for house dust included: cleaning all homes where house dust exceeded 1,000 ppm after remedial actions for yard soil were completed; loaning high-efficiency vacuums to residents; and developing and implementing an interior dust monitoring program. Institutional protection measures in the form of land use restrictions and other administrative restrictions were identified for those populated and non-populated areas where onsite lead concentrations exceed 100 ppm.

In the non-populated area, physical protection measures have focused primarily on the removal and replacement of contaminated soils; demolition and removal of contaminated buildings and structures; revegetation of the hillsides; consolidation of tailings materials; treatment of groundwater, surface water, and AMD; and installation of barriers and caps. Because of the large size and varying geography of the site and the variety of contaminated media (soils, groundwater, surface water, AMD), a wide number of remedies were selected for the non-populated area. This case study does not include the details of those selected remedies.

#### **4.2.2 Institutional Protection Measures**

In 1995, the Idaho Legislature gave the Board of the Panhandle Health District authority to promulgate rules governing contaminant management. The purpose of these rules is to ensure that activities involving excavations, building, development, construction and renovation and grading within the Bunker Hill Superfund Site provide for the installation and maintenance of barriers and implementation of other contaminant management standards to preclude the migration of, and particularly human exposure to, contaminants within the site as necessary to protect the public health and the environment.

Since 1995, the Panhandle Health District has overseen the Institutional Controls Program (ICP).<sup>4</sup> The ICP has three primary components.

- A locally enforced set of rules and regulations to ensure the integrity of clean soil and other protective barriers placed over contaminants left throughout the Bunker Hill Superfund Site.
- Education, sampling assistance, clean soils for small projects (defined as less than one cubic yard of material), pickup of soil removed from small projects, and a permanent disposal location for contaminated solids generated site wide.
- Regulations and assistance with construction and renovation projects on building interiors that involve ceiling and attic work, insulation removal, and work in dirt basements and crawl spaces.

The Bunker Hill Superfund Task Force, which consists of local citizens, decided on three principles by which all elements of the remediation and ICP would be evaluated:

- Minimize inconvenience to and costs for homeowners.
- Use existing controls and local agencies to the maximum extent possible.
- The ICP should be self-sustaining and not impose significant costs on homeowners.

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<sup>4</sup> Note that the Bunker Hill ICP includes activities that go beyond what the Area-Wide Soil Contamination Task Force defines as institutional protection measures.

In addition to conducting ongoing blood level monitoring and providing information about individual protection measures (described below), the PHD is also responsible enforcing for the following institutional protection measures.

- Contractor Licensing. All contractors involved in soil excavations, building renovation, or other activities within the Bunker Hill Superfund site that may break an existing barrier or result in the installation of a new one must be licensed by the PHD to ensure that work is done in such a manner to protect both workers and site residents from exposure to heavy metals, especially lead. To obtain a license, contractors must provide proof of participation in an educational program provided by PHD and must pass a test on the reasons for, and the methods of contaminant management within, the Bunker Hill Superfund site.
- Large Project Work Permits. A large project work permit is required for exterior work involving any of the following activities: excavation of more than one cubic yard of contaminated soil or debris; improvement of property adjacent to exposed contaminated soil; subdivisions and planned unit developments; building demolition; and land clearing activities that expose contaminated material. The PHD provides large work permits. The PHD permit must be issued and valid before work permits issued by any other entity with jurisdiction of land use issues is valid (e.g., the city will not provide a work permit without a PHD permit first). In this regard, the ICP has been tied into the community planning and zoning processes.
- Interior Work Permits. An interior work permit is required for work involving any of the following activities: insulation (installation or removal); work in basements or crawl spaces with exposed soils that are contaminated; ceiling or attic work that is likely to disturb contaminated dust or debris; excavation of contaminated soil from any interior space; and duct work (furnace or air conditioning). The PHD provides the interior work permits. The PHD permit must be issued and valid before work permits issued by any other entity with jurisdiction of land use issues is valid (e.g., the city will not provide a work permit without a PHD permit first).
- Barrier Option Plan. A Barrier Option Plan may be required on large projects in conjunction with a large project work permit. All projects that require engineered plans, including planned unit development and new subdivisions, must include a detailed barrier option plan (BOP) prepared by a qualified professional (architect or engineer). Information pertinent to the BOP is kept on file in the ICP tracking system maintained by the PHD.
- Inspections. The PHD conducts inspection of work conducted under an Interior or Large Project Work Permit. The PHD provides written approval of work conducted and enters that information in the database tracking system, or notes the reasons for disapproval and steps that must be taken to complete the work. Upon completion of the work to the PHD's satisfaction, the PHD records the final approval in the database tracking system and this constitutes the record of compliance for the project.

The PHD also provides the following other services:

- Data Collection and Tracking. The PHD collects and tracks data relevant to the ICP, including information on residential projects and yard cleanups, licensed contractors, permits issued, barrier option plans, and locations of existing barriers and caps.
- Landfill. The PHD provides a landfill where small project soil is disposed.

#### **4.2.3 Individual Protection Measures (as part of public education/outreach)**

The PHD conducts the ongoing public education and outreach program. As part of that program, PHD recommends the following individual protection measures.

- To avoid exposure while conducting home remodeling projects, follow the advice listed in the “Building Renovation-Interior Projects” and “Interior Projects” brochures provided by the Panhandle Health District. These brochures identify those projects requiring an Interior Work Permit (described above) and provide advice to home owners on the following topics: the placement of barriers and other measures (such as vacuuming) to control dust; the use of personal protection measures (such as respirators and coveralls); and the use of gravel to cover soil in crawl spaces or basements.
- For extensive excavation and demolition activities, follow the advice provided in the “Health and Safety Plan” provided for large projects. That brochure identifies those projects requiring a Large Project Work Permit (described above) and provides advice to homeowners on personal protective measures to use while undertaking small projects around the home and yard.
- While working on small projects around the home and yard, the following are recommended.
  - Avoid hand to mouth activities while working in or around soil and dust. These include smoking, chewing tobacco, or eating.
  - Wear coveralls when working with soils and dust.
  - Launder dirty coveralls and other garments separately from other household laundry. Soiled clothes should be stored in a plastic bag.
  - Boots should be brushed off or washed prior to leaving the work site or entering the house.
  - Avoid exposing yourself or others, especially young children or expectant mothers, to contaminated soils, dust, clothing, tools, etc.
  - Control dust by wetting soils prior to digging – do not over wet.
  - Control soil erosion.
  - Wash your hands thoroughly prior to eating.
  - Shower or bathe as soon as you have completed the project or quit for the day.

#### **4.2.4 Technical Assistance/Services**

The PHD also provides a variety of technical assistance/services, including the following.

- Making available respirators, coveralls, plastic, gravel and vacuums to homeowners upon request for use in interior projects.
- Providing guidance for homeowners about the use of plastic covering, temporary barriers such as plastic sheeting, gravel cover, removal of insulation, vacuuming, control of dust, and use of personal protective gear (e.g., respirators and coveralls).
- Providing containers and hauling for homeowners conducting small projects, defined as the removal of less than one cubic yard of soil.
- Providing up to one cubic yard of clean fill materials for homeowners conducting small projects.

#### **4.2.5 Health Monitoring**

As described above, the Panhandle Health District has conducted blood lead monitoring since 1995.

## **5.0 Funding and Legal Authorities**

### **5.1 Funding Sources and Mechanisms**

The funding for activities at Bunker Hill has come primarily from three sources: EPA, the Idaho Department of Environmental Quality, and the potentially responsible parties.

EPA estimates it will cost roughly \$160 million for all cleanup at the site – both populated and non-populated areas. Roughly \$126 million will come from State and Federal sources. Most of the cleanup cost is for the non-populated area where no PRP is performing cleanup. To date, cleanup not provided by the PRPs has been paid for by money from the EPA Superfund Trust Fund. Under law, the State of Idaho is required to match 10% of Federal funds used for cleanup, and conduct and pay for operational and maintenance costs thereafter. Since it has no independent source of funding for its state cleanup program, the State of Idaho requested and received a special appropriation to pay for ten years of matching funds for the Bunker Hill Superfund site cleanup.

Under a 1994 Consent Decree between EPA, the State of Idaho, and the Upstream Mining Group of PRPs, the Upstream Mining Group has been involved in paying for the residential soil cleanup work. PRPs, including the Upstream Mining Group, will pay for an estimated \$34 million of the cost of cleanup at Bunker Hill, mostly in the populated areas. Since 1994, the Upstream Mining Group has been paying roughly \$5-6 million annually for the populated areas cleanup. Costs for the yard removal prior to 1994 were approximately \$20,000 per residence. After the Upstream Mining Group took over the remediation, costs dropped to approximately \$15,000 per residence. Several of the PRPs at the Bunker Hill Site have declared bankruptcy since the closing of the mine and smelter operations. These PRPs have established trust funds to pay for cleanup costs, as part of their bankruptcy settlements.

EPA's costs for community outreach and oversight for the populated areas cleanup have been about \$330,000 since 1994. ID DEQ spends \$200,000 per year for oversight of the Upstream Mining Group's remediation of residential yards; it recovers these costs from the Upstream Mining Group. ID DEQ also spends about \$3,000 per year on community outreach for the Bunker Hill site. ATSDR, through the ID DEQ, funds the PHD to implement the lead health intervention program. Operation of the entire Bunker Hill Institutional Control Program costs roughly \$175,000 per year and includes 1.75 full-time equivalents. Funding has been committed for the first ten years of the ICP, but it is unclear how the ICP will be funded after that period.

### **5.2 Legal Authorities**

EPA has been the lead agency at Bunker Hill by authority provided by the federal Comprehensive Environmental Response, Compensation and Liability Act or Superfund.

The Panhandle Health District's authority for overseeing the Institutional Controls Program is provided by the Idaho State Legislature, as well as through inclusion in the RODs under Superfund.

## **6.0 Lessons Learned**

### **6.1 What Worked Well**

According to ongoing sampling results, average house dust lead concentrations dropped throughout the 1990s in all site communities. By 1999, average concentrations for all communities were under 1000 ppm. As well, blood lead levels in children have continued to drop. As of 1999, the percent of children exceeding the 10 µg/dl Blood Lead Remedial Objective was 4% in Smelterville, 9% in Pinehurst, 6% in Kellogg, 0% in Page, and 11% in Wardner. In this regard – the reduction of lead exposure to children – the protective measures employed may be considered to be effective in the populated areas.

The ICP has been designed as a “cradle-to-grave” approach and its components are designed to work together. This approach has provided the ability for PHD to enforce the program, maintain comprehensive information about activities in the residential areas, and provide incentives to homeowners to dispose of contaminated soils. PHD staff believes this cradle-to-grave approach is a key factor of success for the ICP.

## **6.2 What Did Not Work Well**

One concern expressed by PHD staff was that there is currently no provision for long-term funding of the Institutional Controls Program. At present, the plan for funding only covers 10 years (through 2005). The PHD staff believes that there will be a need to continue to operate most aspects of the ICP beyond that date, and the PHD does not have its own funding to provide for the program.

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# **Institutional Frameworks Case Study**

## **Lowell Brownfields Redevelopment, MA**

### **1.0. Introduction/Summary**

Like many older industrial cities, Lowell, Massachusetts no longer has previously undeveloped and vacant land available for new development. As such, the city has identified the return of its brownfields properties to productive use as critical to economic development and job creation efforts. This case study begins by describing the overall efforts of the City of Lowell to clean up and redevelop brownfields, including efforts to identify, prioritize and assess brownfields. The case study then touches on two specific brownfields redevelopment sites within the city – the completed project that created a new Lowell Regional Transit Authority bus facility, and a planned project involving the siting of a new middle school. The case study also describes a variety of brownfields programs provided by the State of Massachusetts and the federal government, some of which have been critical to successful brownfields redevelopment in Lowell. For example, the case study describes the recently formed state subsidized environmental insurance protection, other liability protections, and a variety of funding mechanisms ranging from grants and loans to tax credits. The case study concludes with a discussion of lessons learned.

The remainder of this case study is organized as follows.

- Section 2 provides background on the city and its overall approach to brownfields redevelopment.
- Section 3 describes two brownfields redevelopment projects in Lowell.
- Section 4 describes other state and federal brownfields programs that are available to and used by redevelopment projects in Lowell.
- Section 5 discusses lessons learned from problem assessment and the implementation of protective measures.
- Section 6 lists references consulted for the case study.

*Brownfields are abandoned, idled, or underused industrial and commercial properties where expansion or redevelopment is complicated by real or perceived contamination.*

### **2.0 Background**

#### **2.1 The City of Lowell**

Lowell, Massachusetts is located on the Merrimack River 30 miles northwest of Boston. The city is roughly 14 square miles and home to 105,000 people and 1,600 businesses. Historical land uses in Lowell have included residential, commercial, and industrial manufacturing, with textile mills being one of the most prominent historic industries. The city grew rapidly during America's Industrial Revolution and throughout the 19th and early 20th centuries. However, after World War I many of Lowell's manufacturing companies closed or relocated to southern states, sending the city into economic decline. The economic decline has continued in recent decades. In 2000, Lowell had 58% fewer manufacturing jobs and a 50% smaller industrial base than it did in 1990. As a result of the economic decline, Lowell is currently faced with a poverty rate of roughly 18% and a large number of abandoned manufacturing buildings and contaminated properties.

## **2.2 The City's Brownfields Redevelopment Approach**

The City of Lowell currently performs a wide range of activities designed to promote the redevelopment of abandoned or underused industrial properties. The City of Lowell has not established a designated Brownfields office to address these problems, but rather has incorporated its brownfields projects into its overall economic development objectives. The city has four full time equivalents (FTEs) within the Division of Planning and Development (DPD) to perform the following types of activities:

- Community Outreach and Education. Lowell has developed a comprehensive, multilingual Brownfields education program. The city's population includes large Asian and Latino communities and many non-English speaking recent immigrants. Because of the significant number of non-English speaking residents, the city's education materials are translated into Portuguese, Spanish, and Khmer (a large portion of the Asian population is Cambodian). As well, all of the community meetings have translators. The city coordinates efforts with several neighborhood-based community groups that have cooperated on public education and outreach efforts. For two of the neighborhoods where Lowell is focusing redevelopment efforts, the city has developed community advisory councils consisting of residents, business owners, and community development corporation staff members. The city is also establishing neighborhood branch offices for outreach.
- Neighborhood planning. Lowell has hired a neighborhood-planning specialist, who is working with community residents to evaluate needs and goals for developing plans for the community.
- Site assessment, prioritization, and coordination. City staff members conduct activities related to site assessment and prioritization. These activities are described further below. City staff members also serve in a coordinating role for brownfields cleanup and redevelopment projects.
- Coordination on health issues. The DPD is working with the City of Lowell's health department to increase staff knowledge about environmental health, improve community outreach skills, gather information about brownfields health hazards, and develop community outreach and education materials.
- Establishment of a Brownfields Cleanup Revolving Loan Fund. The City of Lowell has received federal funding to establish a local Brownfields Cleanup Revolving Loan Fund. Implementation of this effort has been stalled and is described further below.
- City Loan Programs. The City of Lowell has used funding from a Community Development Block Grant received from the U.S. Department of Housing and Urban Development (HUD), as well as HUD Section 108 funds to establish two commercial financing programs that offer low-interest loans to commercial or industrial real estate projects. Loan amounts range from \$21,000 to \$100,000, and can be used for any remediation or cleanup activity.
- Lowell Banking and Business Consortia. The City of Lowell conducted outreach with the local banking community that lead to the development of two nonprofit banking and business consortia to attract and provide financial incentives for investing in redevelopment. The Lowell Development and Financial Corporation (LDFC) is dedicated to cooperative business development and provides loans to generate private investment. The Lowell Plan works towards economic development in Lowell through cooperative alliances between businesses and government. The Lowell Plan has raised \$5 million to encourage development. Both organizations are composed of public, private, and government interests.

Lowell's brownfields redevelopment approach has evolved over the last several years. Important milestones in building the current approach include:

- Identification of Redevelopment Candidates. In the late 1990s, the City of Lowell and a regional planning organization (Northern Middlesex Council of Governments) used an HUD Community Development Block Grant to inventory Brownfields and develop a list of potential sites for redevelopment. This list included 317 sites within the city.
- Site Prioritization. In moving forward with its brownfields redevelopment efforts, the City of Lowell has identified its top 17 sites as priorities for redevelopment in the city (considered as those with the greatest redevelopment potential).
- Site Assessment and Program Development. In 1996, the City of Lowell received a \$200,000 Brownfields Assessment Pilot Grant from EPA and used those funds to develop strategies for redeveloping brownfields and attracting new businesses, rank potential brownfields sites, conduct site assessment of priority sites, and develop a community outreach and education program. The City of Lowell has also received approximately \$240,000 in Brownfields site assessment funds from MassDevelopment, a quasi-governmental real estate and economic development agency.
- Showcase Community and Further Program Development. In 1998, Lowell was named a Brownfields Showcase Community.<sup>5</sup> Brownfields Showcase Communities are supported by the resources of 15 federal agencies to address local cleanup and reuse issues in a more coordinated manner and are models demonstrating the benefits of collaborative activity on brownfields. With this status, the city was awarded another \$200,000 grant and received an Intergovernmental Personnel Assignment (IPA) from the EPA. This staff person served for three years as the Brownfields Showcase Community coordinator and worked closely with the staff at DPD. The IPA brought a level of environmental and technical expertise not previously held by the staff of the DPD, as well as knowledge about funding sources and opportunities. The Showcase Community grant funds have been largely used on environmental assessments, educational materials, and community outreach efforts.

### **3.0 Lowell's Brownfields Redevelopment Projects**

This case study focuses specifically on two brownfields redevelopment projects within Lowell: the Lowell Regional Transit Authority bus operations and maintenance facility and the Acre neighborhood. The first project has been already completed. The second is included because the city has decided to focus about half of its Showcase Community resources on the Acre and one other neighborhood. Some redevelopment activities within the Acre have been initiated already, while many others are still being planned.

#### **3.1 Lowell Regional Transit Authority Bus Operations and Maintenance Facility**

The Lowell Regional Transit Authority (LRTA) Bus Operations and Maintenance Facility was built on a former brownfields site. The facility currently has space for approximately 50 buses along with additional office space.

- Site Description. The 6.4-acre LRTA site has formerly been home to a circuit board manufacturer and an electroplating facility. From 1979 to 1988, the site was home to Astro Circuits. During that time, chemical waste was stored and treated in underground storage tanks, and subsequently illegally

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<sup>5</sup> In March 1998, EPA designated 16 Brownfields Showcase Communities. Twelve additional Showcase Communities were selected in the fall of 2000. EPA has not yet announced its plans for selecting another round of Showcase Communities.

released into the Lowell sewer system.<sup>6</sup> A company called Multi-Core took the building over in 1988 and operated until closing in 1992, leaving behind more contamination, including barrels of chemicals. The site remained vacant from 1992 until the time of redevelopment. Contaminants on the site included copper, nickel, chromium, lead, arsenic, and a variety of solvents.

- Concentrations and Cleanup Levels. The Massachusetts Department of Environmental Protection (DEP) has two types of standard cleanup levels.
  - Risk-based cleanup levels
    - 300 parts per million (ppm) for lead in residential soils
    - 600 ppm for lead in non-residential soils
    - 30 ppm for arsenic in soil
  - Upper concentration limits (UCLs), which are generally 10 times the risk-based cleanup levels and indicate gross contamination
    - 6000 ppm for lead in soil
    - 300 ppm for arsenic in soil

The LRTA site had concentrations of copper and nickel in groundwater above the UCLs. Concentrations of soil contaminants, including arsenic and lead, were between the risk-based cleanup levels and the UCLs. Lead soil concentrations ranged from approximately 30 to 1500 ppm, while arsenic soil concentrations were up to 39 ppm.

- Measures to Address Existing Contamination. Under oversight of a Licensed Site Professional (this program is described in Section 4.1 below), the LRTA evaluated a variety of protective measures for the site, but determined, based on predicted costs and available technologies, that it was not feasible to remediate the site to lower the concentrations of copper and nickel in ground water to below the UCLs. The Licensed Site Professional determined that current environmental conditions at the LRTA site do not pose a substantial hazard to human health, public welfare, or the environment, but since contaminant concentrations exceed the UCLs at the site, the DEP assumes that there is the potential for significant risk to human health, public welfare, or the environment in the future. Based on the results of the site-specific risk characterization and the feasibility analysis, the LRTA opted for, and the DEP approved, a temporary solution (i.e., a solution that addresses current but not long-term risks) of maintaining conditions at the site, rather than a permanent solution, which would have required reducing contaminant levels to below the UCLs. As a result of the temporary solution, every five years or when the property use changes, the LRTA is required to do a feasibility study for DEP to determine whether there is a substantial hazard from current exposures at the site and whether technology is available to make it feasible to remediate the site. Based on the results of the feasibility study, the DEP may require LRTA implement a permanent solution for the site.
- Project Costs and Funding. The LRTA has invested over \$5 million on purchasing and renovating the site.

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<sup>6</sup> Because of this illegal activity, the president of Astro Circuits was the first Massachusetts businessperson to be sent to prison for violating environmental laws.

<b>LRTA Bus O&amp;M Facility Investment</b>	
Purchase Price	\$3.1 million
Site Improvements	\$2 million
<u>Total Site Investment by LRTA</u>	<i>\$5.1 million</i>

- Relationship to the Lowell Brownfields Approach. The LRTA facility is the first development to use the state's Covenant Not to Sue program, described further below. The agreement with the state Attorney General's office leaves LRTA responsible for monitoring the site, per Massachusetts Department of Environmental Protection guidelines, and give the LRTA protection from any suits seeking cleanup or retribution from past contamination. Site testing, performed with help from the MassDevelopment site assessment funds, has found contamination to be centralized and stagnant.

### **3.2 The Acre Neighborhood**

The Acre is a one square mile neighborhood that is also Lowell's oldest and most economically disadvantaged. The City of Lowell has identified the Acre neighborhood as one of its top priorities for brownfields redevelopment. The Acre has many abandoned mill buildings and other industrial sites. The neighborhood has also been designated by HUD as an Enterprise Community area, making it available for specific financial and tax benefits, described below.

The City of Lowell is working in cooperation with the Coalition for a Better Acre (CBA), a local community development corporation. CBA and the city have worked on the development of a twenty-year urban revitalization and development plan for the Acre neighborhood. The city and CBA are holding meetings about a number of topics, including the Acre development plan; the Massachusetts Environmental Protection Act (MEPA) process; state and general environmental regulations; the effect of hazardous waste on property values; brownfields health issues; and issues associated with the relocation of businesses and residents. At each community meeting, background information is provided about the overall goals, history, and issues surrounding brownfields redevelopment, so that even those new to the process will have a basic understanding.

The Acre development plan has been reviewed and approved by the Massachusetts Department of Housing and Urban Development. As well, an Environmental Notification Form must be filed under MEPA to ensure that all redevelopment activities consider environmental issues, such as protection of natural resources. The MEPA process seeks to ensure that the redevelopment does not significantly contribute to environmental degradation, includes environmental assessments, minimizes environmental impacts, and seeks widespread community input.

There are a number of brownfields throughout the Acre neighborhood, a few of which have already been redeveloped. Examples of redevelopment projects in the Acre include the rehabilitation of homes, new residential units in the neighborhood, and the Market Basket, a local grocery store chain.

Currently, the City of Lowell is focusing its attention on a 6 1/2-acre tract where there is a former natural gas facility, businesses, and a few residential properties. The city has identified the need for a new school in the area and hopes to build a middle school on the site. To do so, zoning for the area will be changed from industrial to residential. Studies have found elevated levels of lead and arsenic on the site with concentrations as high as 180 ppm arsenic and 10,000 ppm lead (exceeding the state UCLs for lead and the risk-based limits for arsenic). Average contamination levels include 23 ppm arsenic and 1100 ppm

lead (across multiple depths and over the entire 6 1/2 acres).<sup>7</sup> Most of the analysis on soil contamination has been done by using an XRF (X-Ray Fluorescence) machine.

Although brownfields redevelopment projects are usually conducted by Licensed Site Professionals (described further below), DEP is involved with this project because it is an area where there is high potential for exposure based on proposed land use. DEP is currently reviewing the cleanup and redevelopment plan, which includes several options for a combination of soil removal (in the areas of highest contamination) and capping. One option includes removal of 32,000 cubic yards of soil. This option may not require a cap and is estimated to cost \$1.8 million. Another option includes the removal of 5,000 to 10,000 cubic yards of soil and capping. This second option is the city's preferred option. Any further action on this Brownfields redevelopment project is awaiting the completion of DEP's review.

#### **4.0 Other State and Federal Brownfields Programs Utilized in Lowell Brownfields Redevelopment**

There are a wide variety of state and federal programs and funding sources that the city has either taken advantage of or is eligible for. This section describes those programs and funding sources.

##### **4.1 Technical Assistance/Services**

The Governor's Office for Brownfields Revitalization offers a variety of assistance to landowners, buyers, developers, and municipalities, including the following:

- Information and access to all brownfields programs and other state business incentives;
- Expertise with project sequence and considerations for public and private projects;
- Ombudsman support for brownfields projects;
- Assistance for municipalities and other public entities in pursuing brownfields projects;
- Access to environmental insurance for developers and lenders (the Brownfields Redevelopment Access to Capital (BRAC) program, described further under liability protections);
- Assistance on projects working with other state agencies and quasi-public entities;
- Assistance with municipal tax abatement provision; and
- Administration of an on-line real estate listing service for sellers and buyers of brownfields.

The State of Massachusetts has a privatized cleanup program in that it licenses private professionals to oversee most cleanup projects. This enables state employees to focus on just the most serious cleanup projects.<sup>8</sup> DEP oversees the cleanup of only those situations presenting the highest risk. DEP has established generic cleanup standards for the most frequently found contaminants, allowing the Licensed Site Professionals to determine "how clean is clean enough" up front. Licensed Site Professionals have overseen most of the cleanups of brownfield sites in Lowell. The DEP is directly overseeing the cleanup of the middle school site in the Acre neighborhood.

Cleanup decisions may be risk-based, meaning that the Licensed Site Professional consider the activities that are likely to occur at the site and the corresponding exposures to any remaining oil or hazardous materials on the site. DEP audits all sites with Activity and Use Limitations (AULs), which are deed

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<sup>7</sup> The state cleanup standard for residential or school properties is 30 ppm for arsenic and 300 ppm for lead. However, the state also allows site-specific risk characterization for levels that may be left on site and capped.

<sup>8</sup> The privatized cleanup program was started in 1993. In the three years immediately following the program's creation, annual voluntary site cleanups increased 14-fold.

restrictions and notices that lock in the assumptions that were used to select the appropriate cleanup standards, and provide critical information to future property owners about the status of response actions.<sup>9</sup>

Response Action Outcomes mark the completion of cleanup. DEP conducts random audits of 20% of response actions to ensure that private sector cleanups, conducted by Licensed Site Professionals, have been done properly.

#### **4.2 Health Monitoring**

The Lowell Health Department (LHD) received a one-year grant from the federal Agency for Toxic Substances and Disease Registry (ATSDR) for \$70,000 to help the LHD increase its capacity to address brownfields-related health issues.<sup>10</sup> The primary objectives of this effort are to increase staff knowledge about environmental health and improve community outreach skills, to gather information about brownfields health hazards, and to develop community outreach and education materials. Through this grant, the city has also convened a Community Health Advisory Board, consisting of representatives from neighborhood groups, to identify and address community interests around brownfields. In coordination with the LHD, the Community Health Advisory Board will conduct a community needs assessment, which will establish a baseline measure of community knowledge and priorities for health issues.

#### **4.3 Funding Sources and Mechanisms**

The Acre neighborhood and other census tracts within Lowell have been designated by HUD as an Enterprise Community. As well, the whole city qualifies under state brownfields law as an Economically Distressed Area and has been identified as an Economic Target Area of economic development incentive program benefits. These state and federal designations qualify projects in Lowell for specific financial incentives and benefits described below.

##### Federal Brownfields Tax Incentive

Under the Brownfields Economic Redevelopment Initiative, EPA provides a Brownfields Tax Incentive to assess and cleanup brownfields. In 1996, Lowell received a \$200,000 Brownfields Assessment Pilot Grant from EPA as part of this initiative. With the Brownfields Tax Incentive, environmental cleanup costs are fully deductible in the year they are incurred. Qualified projects must be located in an EPA Brownfields Assessment Pilot area (census tracts where 20% or more of the population is below the poverty level) or a federally designated Empowerment Zone or Enterprise Community, such as the Acre or other neighborhoods in Lowell.

##### Federal Brownfields Cleanup Revolving Loan Fund Pilot Program

Another component of the EPA's Brownfields Economic Redevelopment Initiative is the award of pilot cooperative agreements to state, counties, cities/towns, and Indian tribes to capitalize the Brownfields Cleanup Revolving Loan Fund (BCRLF). The City of Lowell was awarded a BCRLF grant of \$500,000 in 1999 to establish a local BCRLF. However, this money has not yet been used due to what city staff described as "too much red tape" required by EPA. However, they acknowledged that EPA is trying to reduce these impediments and believed that some of the money would be used for the upcoming school development project in the Acre neighborhood.

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<sup>9</sup> The 1998 Brownfields Act appropriated an additional \$10 million for DEP auditing of AUL sites and audits of cleanups performed by Licensed Site Professionals, as well as to establish information systems to support DEP audits and AULs.

<sup>10</sup> The City's Division of Planning and Development has also contributed \$22,000 to help support this effort.

#### State Municipal Back Tax Abatement

Under current state law, municipalities designated as Economic Target Areas can negotiate away outstanding tax obligations at contaminated sites in exchange for a commitment from a new party to clean up and redevelop such sites and return them to the community's tax rolls. As of June 2000, Lowell was one of six cities in the state to adopt the provision. Adopting the local option provision enables a municipality to decide on a project-specific basis how much and whether to abate taxes when a redevelopment opportunity arises. For the municipality to reach agreement with a private purchaser, the purchaser must not have caused or contributed to the contamination and did not own or operate the site with the contamination occurred. The property in question must be zoned for commercial or industrial use and must contain oil or hazardous materials.

#### State Tax Increment Financing/Special Tax Assessment (TIF/STA)

Within Economic Target Areas such as Lowell, certain development projects are eligible for reductions in municipal property taxes that would otherwise be due as the result of increasing the value of properties through remediation and redevelopment. With Tax Increment Financing, some or all of the increased value that accrues from remediating and redeveloping a property may be exempt from municipal property taxes for a certain time period negotiated with the municipality. Through Special Tax Assessments, developers may negotiate the entire property tax assessment of a property including pre-rehabilitation values with municipalities according to certain formulas specified by state law. Both mechanisms for reducing municipal property taxes depend on the willingness of the municipality to extend a TIF or STA to a particular redevelopment project.

#### State Tax Credit

The state has made tax credits available for cleanup costs. To qualify for the tax credit: (1) the taxpayer must be an innocent owner (e.g., did not cause or contribute to the contamination); (2) the cleanup costs must be 15% or more of the pre-remediation property value; (3) the property must be located within a designated Economically Distressed Area (such as Lowell); (4) cleanup must be conducted in compliance with applicable laws; and (5) the property must be owned or leased for business purposes. Properties without an Activity and Use Limitation (AUL) on the property are eligible for a 50% tax credit. Properties with an AUL are eligible for a 25% tax credit.

#### State Abandoned Buildings Tax Deduction

Under state law, projects in Economic Target Areas, such as Lowell, are eligible for a State Abandoned Building Tax Deduction of 10% of renovations costs, provided that the building has been at least 75% vacant for two years.

#### State Brownfields Redevelopment Fund

The Massachusetts Brownfields Redevelopment Fund provides state funding for loans and grants for site assessments and remediation actions. The \$30 million fund is administered by MassDevelopment, a quasi-public real estate and economic organization, and is available for both the private and public sectors. Thirty percent of the funds are earmarked for site assessments and include loans up to \$50,000 with zero percent financing. Maximum financing is \$500,000 for cleanup projects. Eligible projects must be in Economically Distressed Areas, such as Lowell.

### **4.4 Liability Protections**

The federal government has defined liability and liability protections under Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). This section, however, focuses on the state programs designed specifically to address brownfields redevelopment.

#### State Subsidized Insurance Program – Brownfields Redevelopment Access to Capital (BRAC)

The Massachusetts Business Development Corporation (MassBusiness) is a private corporation created to provide loans and investment capital to businesses in Massachusetts. Through MassBusiness, the state provides access to a state-subsidized and created insurance program for lenders and developers. The 1998 Brownfields Act appropriated \$15 million for establishment of BRAC. Through BRAC, the state subsidizes 50% of the insurance premium for most business projects. With this subsidy, the costs of coverage can be as little as \$15,000 for a \$5 million project, with cleanup costs of \$1 million.

#### Developers

The BRAC program provides environmental insurance<sup>11</sup> for developers designed to cover both cleanup cost overruns and liability arising from newly discovered pre-existing environmental contamination.

#### Lenders

The BRAC program provides secured creditor coverage designed to protect lenders from loss due to a default related to environmental issues. Secured creditor coverage includes: (1) protection for lenders against loss on cleanup loans and contemporaneous related construction loans, and (2) protection from default on project loans arising from unanticipated environmental costs, in the unlikely event that the environmental insurance coverage is insufficient.

#### State Statutory Relief

Under the 1998 Massachusetts Brownfields Act, once a site is cleaned up, innocent persons are relieved of liability to the state and third parties. Innocent persons are defined as those who did not own or operate the site at the time of the release of contaminants and who did not cause or contribute to the contamination at the site. As well, tenants, down gradient property owners, redevelopment authorities, community development corporations, economic development and industrial corporations, municipalities, government bodies, charitable trusts, and secured lenders are relieved of liability to the state and third parties, in many cases without having to conduct any cleanup action to obtain or maintain liability relief.

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<sup>11</sup> Environmental coverage includes the following. (1) Cleanup costs that exceed the planned costs for the approved cleanup plan. Deductible equals 15% of cleanup costs for cost cap coverage. (2) Cleanup costs for unknown pollution conditions discovered during cleanup, within planned cleanup and property boundaries. (3) Cleanup costs for unknown conditions discovered outside of planned cleanup, but within property boundaries. (4) Third party coverage for cleanup costs, property damage, and personal injury resulting from preexisting, yet unknown conditions beyond the insured's property boundaries. (5) Business interruption coverage for the insured's losses due to pollution being discovered outside the planned cleanup area. (6) Legal defense coverage for claims arising from pollution conditions outside of the planned cleanup area. (7) Five-year term, with the option to renew.

### State Covenant Not to Sue.

Under the 1998 Massachusetts Brownfields Act, a party who conducts a cleanup and redevelopment but does not qualify for the statutory relief described above may negotiate with the Office of the Attorney General for liability relief from the state and third parties and for property damage. The broader liability relief was developed to prompt more owners to put properties back to use. A Brownfields Covenant Not to Sue can offer liability protection to parties for sites where a permanent solution (no significant risk from current or future exposures) is deemed infeasible so that the cleanup achieves a temporary solution (no substantial risk from current exposures). To qualify, the project must contribute to the physical or economic revitalization of the community in which it is located. The LRTA facility in Lowell was the first facility to use the state's Brownfields Covenant Not to Sue program.

## **5.0 Lessons Learned**

### **5.1 What Worked Well**

The City of Lowell has successfully leveraged funding from a variety of state, federal, and private sources for its projects, reducing the amount of local resources needed to redevelop sites. It has also successfully attracted private investors and developers to its brownfields sites.

One challenge the City of Lowell has faced, especially in attracting private redevelopment projects, has been apprehension on behalf of lenders and developers about contamination of brownfields sites. City staff members believe that the state site assessment funding has been critical to getting developers and lenders over their "fear of the unknown" by providing the ability to find out the actual nature of contamination on a site.

Staff members at DPD believe that the IPA provided by EPA for three years was critical to their success. The IPA provided a level of environmental and technical expertise and experience that the city staff did not previously have. By the end of the three years, the city staff had gained significant experience in these areas. As well, the IPA was invaluable in helping to identify funding sources that the city has been successful in leveraging.

DPD staff members also believe Lowell has benefited from the State of Massachusetts' brownfields legislation. Massachusetts is a leader in creative solutions to brownfields redevelopment issues, including tax credits, financial incentives, and liability protections. City staff members also believe that a critical aspect to the Massachusetts Brownfields programs and legislation has been having the involvement of the right agencies; for example, having the Department of Revenue provide tax relief programs. This involvement of many state agencies has required coordination and communications between agencies. The Governor's Office for Brownfields Revitalization has provided this critical function and helps funnel projects to the right state agencies.

### **5.2 What Did Not Work Well**

One of the city's most obvious successes, its ability to coordinate among organizations and government agencies to raise funds for redevelopment projects, also points to one of its biggest challenges. To date, many of the successful redevelopment efforts in the city have been largely funded by public entities and have been public projects (e.g., the LRTA bus facility, as well as a large public arena and ballpark not included in this case study). Although the city has developed a number of strategies to attract private developers, at this point in time it is difficult to point to examples of successful private redevelopment projects in the city. This is not to say that private redevelopment projects have not occurred, and the city is hopeful that the strategies it and the state has developed to attract private developers will be successful.

Another challenge faced by DPD staff is Lowell's historic lack of community involvement. This is in large part due to the high percentage of non-English speaking residents and high percent of non-citizen

residents. For example, of the more than 35,000 Southeast Asian residents, fewer than 1,000 of them are naturalized citizens. Another factor contributing to the lack of community involvement is the high number of renters. For example, in one neighborhood, the home ownership rate is currently only 15% - one of the City of Lowell's goals is to increase home ownership rates.

Staff members from DEP have expressed mostly positives and a few negatives about the nature of the state's brownfields programs. They believe that having the involvement of a number of state agencies has been key to the success of brownfields redevelopment. However, there are also some disadvantages of not having a centralized brownfields program. For example, the number of different agencies involved has required extensive communications and education efforts. It has been an ongoing challenge to get the word out about the variety of programs available.

Another example cited by DEP staff is that the state does not have an official definition of brownfields, and sites do not sign up or register as brownfields. This has made it difficult to measure and demonstrate success to other parties, such as the state legislature. Those who legislate funding for the state's programs frequently ask questions such as "how many brownfields sites have been cleaned up?" Because of the lack of official definition or centralized program, it has been difficult to impossible to answer that type of question and demonstrate real success.

Because of the nature of the statutory relief provided under Massachusetts state law, property owners do not receive written statement of this liability relief. Staff members at the City of Lowell believe this has created some confusion for people, who would prefer to have a written statement.

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# **Institutional Frameworks Case Study**

## **Mount Laurel Township, New Jersey**

### **1.0 Introduction/Summary**

Mount Laurel Township is one of many places in New Jersey where former orchards and other agricultural areas have been and are being developed into residential housing, commercial businesses, and public facilities. Historical use of pesticides, including lead arsenate, contaminated these properties with arsenic, lead, dieldrin, and other organochlorides. In response, Mount Laurel Township was one of the first municipalities in New Jersey to enact an ordinance requiring soil testing and cleanup of new developments on properties with historical pesticide contamination. The State of New Jersey allows a wide variety of protective measures, including soil blending or tilling, to be used at pesticide contaminated sites and has institutional mechanisms, such as deed notice reporting requirements and a so-called “cap cop,” to ensure that physical protection measures remain effective. This case study discusses how Mount Laurel Township identified and addressed the issue of historical pesticide contamination, provides examples of developments on former farmland in Mount Laurel, describes the State of New Jersey’s approaches to address historical pesticide contamination, and concludes with lessons learned from these experiences.

The remainder of this case study is organized as follows.

- Section 2 provides background on Mount Laurel Township and its approach to address historical pesticide contamination.
- Section 3 describes examples of developments on formerly agricultural land in Mount Laurel.
- Section 4 discusses the New Jersey Department of Environmental Protection's approach to address historical pesticide contamination.
- Section 5 discusses lessons learned from problem assessment and the implementation of protective measures.
- Section 6 lists references consulted for the case study.

### **2.0 Background**

#### **2.1 Mount Laurel**

Mount Laurel is a roughly 22 square mile Township of over 40,000 people located in south-central New Jersey near the western border with Pennsylvania. Mount Laurel is in Burlington County, historically one of New Jersey’s leading agricultural counties. The Township’s population has more than doubled in the last 20 years, and much of the new development in Mount Laurel and other areas of Burlington County has been on formerly agricultural land. One of Mount Laurel Township’s current challenges is to preserve open space, much of which is or was in agricultural production, in the face of high demand for residential housing.

Mount Laurel has high levels of naturally occurring arsenic in soils—with concentrations over 300 parts per million (ppm) in some places with glauconitic soil—as well as historical pesticide contamination at former orchards and other agricultural areas where pesticides such as lead arsenate, dieldrin, and other organochlorides were used. The main contaminants of concern at properties with historical pesticide contamination are arsenic and dieldrin. In the past, developers removed topsoil from farmland and sold the topsoil prior to developing the land. As a result, arsenic concentrations in formerly agricultural areas of Mount Laurel—typically around 20-50 ppm—are probably lower than they were just prior to development.

## **2.2 Mt. Laurel's Approach to Development of Former Agricultural Lands**

Mount Laurel Township became aware of the issue of historical pesticide contamination through media reports of the New Jersey Department of Environmental Protection's (NJDEP) emergency cleanup of residential properties with historical pesticide contamination at the Burlington Heights development in nearby Burlington Township in 1996.

- Soil Removal at Burlington Heights Development. Burlington Heights is a housing development located on part of a former orchard. In 1995, a developer who wanted to develop the remaining undeveloped portions of the orchard into a new housing development, called Sunset Ridge, sampled the soils. Because arsenic concentrations exceeded the NJDEP's soil cleanup criterion of 20 ppm (arsenic concentrations were up to 165 ppm), the developer contacted the NJDEP about doing a voluntary cleanup. From these sampling results, the NJDEP realized that there might be historical pesticide contamination at existing residences since they had not been previously remediated. In 1996, NJDEP conducted an "emergency" soil removal at existing residential yards at Burlington Heights. The emergency removal at residences included sampling residential yards, removing contaminated surface soils, and replacing them with clean fill and sod. NJDEP paid \$500,000 for public outreach, sampling, soil removal, and soil and sod replacement at Burlington Heights.

It was this cleanup at Burlington Township that provided the impetus for the NJDEP to form a Historic Pesticide Contamination Task Force to recommend strategies for addressing historical pesticide contamination (discussed further below).

After learning from a newspaper article that historical pesticide contamination was likely to also be a problem in Mount Laurel, the Township did some research using historic aerial photographs and maps of the Township to identify areas that had previously been orchards or other agricultural areas. Based on this research, the Township notified residents of formerly agricultural areas of the potential for historical pesticide contamination problems and distributed recommendations from the Township's Health Department for individual protection measures to reduce exposure, such as hand washing. At first, there was a large public outcry from residents in housing developments on formerly agricultural land, but residents' concerns rapidly died down after the initial reaction. Other municipalities also criticized the Township for letting people know about the potential problem. A couple of property sales fell through after information about historical pesticide contamination in Mount Laurel was more widely known, but these properties eventually sold for more than their original prices.

In addition to notifying existing residents about potential historical pesticide contamination problems, Mount Laurel Township enacted an ordinance requiring soil testing and cleanup of properties prior to new development—both residential and non-residential—in the Township.

## **2.3 Mount Laurel Soil Testing and Cleanup Ordinance**

In July 1996, Mount Laurel Township enacted a "Soil Testing and Cleanup" ordinance, which is now Chapter 133 of Mount Laurel Township's Code. The ordinance requires that soils be tested before any new residential or non-residential development occurs to determine whether the concentrations of any substances on the property exceed NJDEP soil cleanup criteria. If any contaminants exceed the State cleanup criteria, the property must either be completely remediated according to State rules and regulations, or the developer needs to provide documentation from the NJDEP stating that the property may be developed with less than complete remediation according to a plan approved by the NJDEP.

In practice, instead of requiring soil testing for all properties, Mount Laurel Township allows developers to conduct a Phase I environmental assessment of properties to determine whether the properties may have been used for agriculture in the past or may have contamination associated with other past land uses and submit those assessments to the Township Engineer for review. The Township Engineer reviews the

Phase I assessments submitted by developers and, if pesticides or other sources of contamination may be present, instructs the developers to test soils at the properties as part of Phase II environmental assessments and work with the NJDEP to conduct any necessary remediation. These working procedures have been developed, and were recently finalized in an amendment to the Soil Testing and Cleanup Ordinance, to reduce the burden of the ordinance on developers and to tie the ordinance to existing development processes, such as Phase I environmental assessments, and to the State's voluntary cleanup program.

In 2002, Mount Laurel Township made several changes to its soil testing and cleanup ordinance, including the following.

- It made the soil testing and remediation requirements apply only to properties that were formerly part of an agricultural area or orchard (as determined by the Township Engineer) as opposed to all properties about to be developed.
- It changed the ordinance to allow "No Further Action" letters from the NJDEP as documentation that any necessary remediation has occurred on the undeveloped properties that were formerly part of an agricultural area or orchard.

### **3.0 Mount Laurel Development Projects**

In addition to private developments, Mount Laurel Township has developed recreational facilities on former farmland and has acquired former farmland for preservation as open space. Mount Laurel Township also works with the NJDEP and ensures that cleanups on properties owned by the Township are consistent with NJDEP Technical Requirements for Site Remediation. Mount Laurel Township uses an Open Space Trust Fund approved by voters in 1998 to acquire open space and requires that current property owners clean up properties before purchase.

Examples of public and private developments on former farmland in Mount Laurel include hockey rinks at Devonshire Park, the Fentell housing development, and Bobby's Hunt housing development, all of which are discussed below.

#### **3.1 Consolidation and Capping for Devonshire Park Development**

Devonshire Park is a roughly four-acre public recreation area—including three roller hockey rinks, two tennis courts, and a basketball court—developed by Mount Laurel Township on the site of a former apple orchard that had contamination from the use of lead arsenate and other pesticides. The Township remediated the property—which had some areas with arsenic soil concentrations above 20 ppm, NJDEP's cleanup criterion for arsenic—by consolidating and capping the contaminated soil under areas that would become roller hockey rinks and under a berm on the property. Arsenic concentrations were generally less than 50 ppm. Because the Township used capping to prevent exposure to contaminants at the site, the Township will also place a deed notice on the property and will be required by the NJDEP to inspect the caps to ensure they remain protective and report to the NJDEP every two years. The development of Devonshire Park has cost the Township almost \$1 million, including \$200,000 to construct the hockey rinks.

#### **3.2 Soil Blending for Fentell Housing Development**

The Fentell housing development, which is being developed in phases, is located on a 133-acre property in Mount Laurel. Fifty-five acres of the property had been used for agriculture, mostly as an apple orchard. Owners of the farm had used arsenical pesticides including lead arsenate at the orchard. Arsenic was the only contaminant on the property in concentrations above NJDEP's cleanup criteria. About two acres of the property had arsenic soil concentrations above 20 ppm, NJDEP's cleanup criterion for arsenic, and one area had an arsenic concentration of 42.5 ppm. The developer decided to blend contaminated soils on the property with clean soil to address the historical pesticide contamination on the

property. Soil blending of the two acres of contaminated soil and all the associated contracting work, including sampling and investigation of contamination at the 133-acre site, cost the developer \$75,000. The property is adjacent to wetlands and access to contaminated areas on the property was difficult, so this increased the costs of remediation. (Unlike this example, the NJDEP has found that typically soil blending is less expensive than soil removal for remediating historical pesticide contamination sites if soil concentrations are less than five times the cleanup levels.)

### **3.3 Soil Removal for Bobby's Hunt Housing Development**

Bobby's Hunt was a 14-acre farm in Mount Laurel that is being developed into a residential development for about 14 homes. Lead arsenate had been used as a pesticide at the farm, which resulted in average arsenic concentrations of 23 ppm in surface soils. Arsenic was the only contaminant on the property in concentrations above NJDEP's cleanup criteria. About four acres on the property had arsenic soil concentrations above 20 ppm. In addition, the site had naturally occurring arsenic at depths below three feet, where the soil was rich in glauconite. To remediate the property, the developer decided to excavate the top foot of soil from the four acres of the property with arsenic concentrations above 20 ppm and dispose the contaminated soil in a landfill. The developer's total costs for this cleanup—including consultant fees, sampling costs, and fees for excavation and transport of contaminated soils (there was no charge for disposal)—were \$7,000.

## **4.0 State Programs Related to Historical Pesticide Contamination**

### **4.1 The Historic Pesticide Contamination Task Force**

The State of New Jersey formed the Historic Pesticide Contamination Task Force in 1997 to identify technically and economically viable alternative strategies that will be protective of human health and the environment for sites with contamination due to historical use of pesticides. The Mount Laurel Township Manager served on the Task Force, representing the New Jersey State League of Municipalities. The Task Force offered a variety of recommendations to assist those involved in the remediation of agricultural properties that have been developed and that will be developed in the future. As of this date, the Task Force recommendations have not been formally adopted by the State legislature, but are instead used by the NJDEP as guidance. In addition, NJDEP has adopted some of the individual Task Force recommendations. These recommendations, which are discussed below, include allowing soil blending as a remediation alternative, developing guidance concerning sampling methods and exposure control alternatives, and recommending sampling of former agricultural areas prior to site development.

#### Lending Institutions' Requirements for Site Assessments

Due to the state-wide attention to historical pesticide contamination issues, caused largely by the formation of the Historic Pesticide Contamination Task Force, many lending institutions in New Jersey have adopted requirements for environmental site assessments as a condition for granting loans to develop agricultural properties.<sup>12</sup> Often banks ask property owners or developers to obtain a No Further Action letter from NJDEP before issuing loans for those properties. A No Further Action Letter can be achieved either through cleanup of the property or through an environmental site assessment indicating that no cleanup is necessary. In this manner, banks are often the trigger to identifying contamination at agricultural properties undergoing development in New Jersey.

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<sup>12</sup> In addition, according to the New Jersey Bankers Association, some banks in New Jersey have chosen to no longer lend to farms.

## **4.2 Legal Authorities**

There are two trigger points for the involvement of NJDEP in historical pesticide contamination cases (both must be satisfied).

1. There is a change in land use (i.e., former agricultural land is being converted to other uses).
2. Sampling demonstrates contaminant concentrations that exceed unrestricted use cleanup standards as defined in the NJDEP Soil Cleanup Criteria (includes the following: 20 ppm for arsenic, 400 ppm for lead, 2 ppm for DDT, 0.04 ppm for Aldrin, and 0.042 ppm for dieldrin).

The Soil Cleanup Criteria are used as indicators that a cleanup might be required. Other criteria, such as environmental impacts, site-specific conditions and background levels, may also be considered, and these could result in a site-specific cleanup level that differs from the Soil Cleanup Criteria. All proposed site-specific cleanup levels that exceed the Soil Cleanup Criteria must be approved by NJDEP.

## **4.3 Protective Measures for Addressing Historical Pesticide Contamination**

NJDEP has adopted the following range of strategies for cleaning up historical pesticide contamination.

- Excavate and dispose of contaminated soil in a landfill.
- Excavate and bury contaminated soil, which must be more than five feet from seasonal groundwater when buried.
- Leave contaminated soil in place and install a cap. (This has associated deed notice requirements.)
- Consolidate contaminated soil in an area on site and cap that area. (This has associated deed notice requirements.)
- Blend contaminated soil with clean soil or till the contaminated soil to mix it with deeper, less contaminated soil. (This has associated post-blending sampling requirements.)
- If a farmer is selling only one part of a property, the farmer can move soil from the parcel being sold to other parts of the property. (This has no associated deed notice requirements.)

## **4.4 Physical Protection Measures**

### **Soil Blending and Tilling**

In response to the recommendations of the Historic Pesticide Contamination Task Force, NJDEP has allowed, in its 1998 Revised Guidance Document for the Remediation of Contaminated Soils, soil tilling (i.e., turning over the soil) or soil blending (i.e., mixing with the clean soil) as a strategy only for formerly agricultural lands. Soil tilling or blending allows contaminated surface soils to mix with cleaner soils below the surface or allows contaminated surface soils to blend with “clean” fill brought in from off the site.

NJDEP has also developed a testing protocol for clean soil to be used in soil blending at historic pesticide residue sites. This protocol defines clean soil as that which is:

- Similar in physical properties to the soil in or adjacent to the area of concern;
- Free from extraneous debris or solid waste;
- Of equal or less permeability than the native soil in or adjacent to the area of concern;
- Accompanied by source document as required by the Technical Requirements for Site Remediation (i.e., certification that it is virgin material or decontaminated recycled soil and is not contaminated pursuant to any applicable remediation standards); and
- Uncontaminated pursuant to a comparison of data to the NJDEP’s most recent unrestricted use Soil Cleanup Criteria. (NJDEP also provides sampling requirements to demonstrate that soil is uncontaminated. This involves using a composite from five individual and representative samples.)

Soil blending also has stringent post blending sampling requirements, including:

- Four samples of surface soil (0-6”) must be taken per acre, and
- For each location where blending has occurred, samples must be taken at greater depths.

#### **4.4 Other Measures That Limit Exposure**

All protective measures that do not remove contaminated soil from the site, but rather consolidate, contain, and/or restrict access to contamination left on site while reducing exposure (such as caps, fences, containment walls, etc.) have associated deed notices and biennial reporting requirements to the NJDEP. As a condition of the No Further Action/Covenant Not to Sue Letters (described below), and in order to maintain the benefit of the Covenant Not to Sue, these types of protective measures (referred to by NJDEP as “engineering controls”) must be evaluated every two years to ensure the measures remain protective. The NJDEP also has a so-called “cap cop” that periodically inspects a certain portion of the caps and other physical protection measures that limit exposure to contamination left on site. The cap cop checks on the validity of the reports to the NJDEP and ensures that the physical protection measures remain effective.

#### **4.5 Institutional Protection Measures**

##### **Deed Notices**

A deed notice is required by NJDEP when contaminated soils are present at a site above the Residential Direct Contact Soil Cleanup Criteria before the issuance of the No Further Action/Covenant Not to Sue letter. If a property is sold, the deed notice will provide notice to subsequent owners and other prospective users (lessees, etc.). The deed notice will provide information regarding the site, presence of contaminants, and any compliance monitoring requirements. The requirements may include, but are not limited to: cap maintenance, inspection requirements, and notification requirements.

Deed notices have associated biennial reporting requirements. To comply with the requirements, the person holding the deed notice must certify:

- That the deed notice has been properly filed and remains on file with the office of the county recording officer and no subsequent notices have been filed to nullify the original notice;
- That the land use is consistent with the use restrictions identified in the deed notice;
- That any excavation or disturbance that has taken place within the restricted area enumerated in the deed notice, since the last biennial certification presents no unacceptable risk to the public health and safety or the environment; and
- That any controls to limit exposure (e.g., caps, fencing, containment walls, etc.) are being inspected and maintained and their integrity remains so that the remedial action continues to be protective of the public health and safety and of the environment.

#### **4.6 Individual Protection Measures**

NJDEP has developed information for homeowners and buyers about historic pesticide contamination and potential human health impacts. NJDEP lists arsenic, lead, DDT, Aldrin, and their breakdown products (e.g., dieldrin) as the primary pesticides of concern. NJDEP also provides information on the known health effects of these pesticides as well as the NJDEP soil cleanup criteria. NJDEP estimates that up to five percent of the state’s acreage may have historical pesticide contamination and indicates to homeowners that the primary health concerns have to do with human health impacts resulting from long-term ingestion of contaminated soil, particularly by children. In addition to providing contacts for further information, NJDEP homeowners/buyers guidance provides the following recommendations.

- Soil sampling should be conducted when an agricultural property changes land use (i.e., farmland developed into a housing development or municipal park).
- Soil sampling should be conducted in former agricultural areas intensively used by children (schools, daycare centers, playgrounds).
- At any time, if a property owner wants NJDEP approval of their investigation, they would need to conduct a thorough environmental evaluation of the property and should consult NJDEP for guidance.
- Homeowners interested in testing the soil on their own property should contact NJDEP for guidance on the sampling procedures.
- Several actions can be taken to minimize the chance of contact with contamination that may be in the soil.
  - Keep good grass coverage; this acts as a barrier to contact with the soil below.
  - Cover any disturbed or excavated soil.
  - Wash fruits and vegetables from your garden before eating. Uptake of contaminants into the food is not as much of a concern as possible ingestion of the soil.
  - Wash hands and face after playing outside and before meals and snacks.
  - Wash toys and pacifiers frequently.
  - Mop surfaces where children play.

(Source: New Jersey Department of Environmental Protection Site Remediation Program. “Historic Pesticide Contamination: Information for home owners, home buyers and other members of the public”, January 1999 (updated October 23, 2000).

#### **4.7 Technical Assistance/Services**

##### **Soil Sampling and Investigation**

NJDEP provides guidance on soil sampling procedures for homeowners/buyers, as well as general sampling requirements for people conducting a remediation.

NJDEP provides approval of homeowners’ soil contamination investigation. To receive this approval, the owner must conduct a thorough environmental evaluation of the property in conformance with NJDEP guidance.

#### **4.8 Liability Protections**

##### **No Further Action Letters and Covenants Not to Sue**

The NJDEP includes a Covenant Not to Sue with all No Further Action Letters issued for an area of concern or a full site. As part of NJDEP’s Voluntary Cleanup Program, NJDEP issues a No Further Action Letter after a developer or property owner has remediated a site according to the NJDEP Technical Requirements for Site Remediation. The No Further Action Letter informs the developer or property owner that the NJDEP intends to take no further action, such as requiring cleanup, at the site. The Covenant Not to Sue, as stated in the revised Technical Requirements for Site Remediation, consists of the following statement: “[NJDEP] will not bring civil action for payment of compensation for damages to, or loss of natural resources, against parties who are not liable for cleanup and removal costs and who undertook the remediation of a site or are the subsequent owners, lessees, or operators of the property. This protection from exposure to liability could encourage more private parties to proceed with remediating contaminated sites, thus limiting the public’s exposure to contamination.”

### Innocent Purchaser Protection

The State of New Jersey provides “Innocent Purchaser Protection.” The protection provides a purchaser, who did not cause or contribute to the contamination and who investigates and remediates a property, with liability exemption from the New Jersey Spill Compensation and Control Act.

## **5.0 Lessons Learned**

### **5.1 What Worked Well**

#### Quick Response to Potential Health Threat

Mount Laurel Township took immediate actions to address potential health threats posed by historical pesticide contamination, including identifying potential areas of concern, notifying residents, and providing recommendations for reducing individual exposure. It also was one of the first municipalities to enact an ordinance to address potential contamination at future developments.

#### Working Procedures for Soil Testing and Cleanup Ordinance

The working procedures Mount Laurel Township developed for the Soil Testing and Cleanup ordinance reduced the burden of the ordinance on developers by aligning the Township’s requirements to existing development processes and the State Voluntary Cleanup Program. This minimized the amount of additional time or cost imposed on developers by the ordinance.

### **5.2 What Did Not Work Well (or Challenges Being Faced)**

#### Adoption of Soil Testing and/or Cleanup Requirements by Other Local Governments

Other municipalities with historical pesticide contamination tried to follow the lead of Mount Laurel and Burlington Townships by adopting requirements for soil testing and cleanup, but many have failed. In addition, a State Court ruling in 2001 on a legal suit brought by the New Jersey Business League stated that municipalities cannot impose requirements on developers or property owners for testing and remediation of historical pesticide contamination that are greater or more strict than a No Further Action Letter and Covenant Not to Sue issued by the NJDEP as a condition for land development approval.

#### Adoption of Task Force Recommendations

The State of New Jersey made the Historic Pesticide Contamination Task Force’s report an advisory document rather than adopting the entirety of the Task Force’s recommendations as regulatory requirements. The NJDEP, however, uses many of the Task Force’s recommendations, such as the use of soil blending or tilling as a protective measure for sites with historical pesticide contamination, in guidance to developers in the State’s Voluntary Cleanup Program.

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# **New Jersey Historic Pesticide Contamination Task Force Recommendations**

## Background

The New Jersey Department of Environmental Protection (the Department) formed a Historic Pesticide Contamination Task Force in 1997 to help the Department “identify technically and economically viable alternative strategies that will be protective of human health and the environment for sites with contamination due to historical use of pesticides.”<sup>13</sup> The Task Force comprised nine members representing a variety of interest groups, including agriculture, environment, real estate development, banking, local government, and research institutions. It met several times over a roughly two-year period and issued its final report in March of 1999.

## Task Force Recommendations

In its report, the Task Force recommended:

- That a systematic statewide approach be developed to identify and remediate sites with historical pesticide contamination through:
  - Sampling and any necessary remediation of former agricultural areas prior to development
  - Sampling and any necessary remediation of areas with exposed soils that are intensively used by children
  - Sampling and any necessary remediation of other developed areas when desired by current or potential future occupants
- That a variety of remedial approaches—including soil blending, which was not allowed previously—be allowed for sites with historical pesticide contamination
- That the Department increase knowledge and access to information on historical pesticide contamination and exposure control alternatives through education, disclosure approaches, and additional research

## State of New Jersey’s Response

The Department has taken only limited actions to implement the Task Force’s recommendations. To date, the Department has not developed a systematic statewide approach to identifying and remediating sites with historical pesticide contamination, nor has it developed an education or outreach campaign or undertaken new research. For the most part, sites that require remediation are addressed on a case-by-case basis using the existing voluntary cleanup program. The Department did change some of its procedures regarding soil testing and remediation for sites with historical pesticide contamination. It now allows soil blending as a strategy for reducing contamination only at historical pesticide sites and has developed a soil testing protocol for soil blending (including site investigation prior to soil blending) and for determining “clean” soil. The Department also has issued a Fact Sheet on historical pesticide contamination and individual protection measures, maintains a website and responds to public inquiries about the issue, and plans to develop an interactive tool to make information on sampling conducted at contaminated sites accessible to the public.

In addition, some municipalities in New Jersey have established requirements that former agricultural sites undergo an environmental evaluation before being developed. Based on these evaluations site developers may be referred, as necessary, to the voluntary cleanup program. And, as knowledge and

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<sup>13</sup> Historic Pesticide Contamination Task Force, *Final Report: Findings and Recommendations for the Remediation of Historic Pesticide Contamination*, March 1999, available at <http://www.state.nj.us/dep/special/hpctf/index.html>.

awareness of the issue grow, many developers and lenders independently undertake (or require) site evaluations, and sites may be referred to the voluntary cleanup program as a result.

The following table lists each of the Task Force's recommendations and the actions that the State of New Jersey has or has not taken in response to each recommendation.

Key:

- ✓ indicates that a change was made to adopt the recommendation.
- indicates that no change was needed to adopt the recommendation.
- × indicates that the recommendation has not been adopted.

HISTORIC PESTICIDE CONTAMINATION TASK FORCE RECOMMENDATIONS	NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION ACTIONS
<b>VII. A. Site Investigation and Remediation</b>	
<ul style="list-style-type: none"> <li>• Sampling of former agricultural areas, and any necessary remediation, should be conducted prior to site development</li> </ul>	× The Department did not develop a program to require systematic sampling of former agricultural areas prior to development; however, some municipalities have adopted such requirements. At the state level, sampling and cleanup needs are addressed on a site-by-site, ad hoc basis using pre-existing state programs such as the voluntary cleanup program.
<ul style="list-style-type: none"> <li>• Sampling of former agricultural areas, and any necessary remediation, should be conducted for areas with exposed soil that are intensively used by children, such as schools, daycare centers and playgrounds.</li> </ul>	× The Department did not develop a program to require systematic sampling of child-use areas. Sampling and cleanup needs are addressed on a site-by-site, ad hoc basis using pre-existing state programs such as the voluntary cleanup program.
<ul style="list-style-type: none"> <li>• Sampling and remediation at sites that have already been developed, except as noted above, should be conducted whenever the current or potential future occupant desires.</li> </ul>	× The Department did not develop a program to require systematic sampling or remediation of developed sites on the request of the current or future occupant; it is up to the property owner to voluntarily address such concerns. Sites, and requests, are addressed on a site-by-site, ad hoc basis using existing state programs, such as the voluntary cleanup program.
<ul style="list-style-type: none"> <li>• The Department should provide guidance concerning sampling methods and exposure control alternatives to any person concerned with historic pesticide contamination.</li> </ul>	✓ The Department has developed guidance on sampling methods (see below) and a fact sheet that includes information on practical exposure control alternatives for individuals.

HISTORIC PESTICIDE CONTAMINATION TASK FORCE RECOMMENDATIONS	NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION ACTIONS
<ul style="list-style-type: none"> <li>The Department should provide an appropriate sampling methodology specifically designed for the investigation of pesticide residues in soil at agricultural properties.</li> </ul>	<ul style="list-style-type: none"> <li>✓ The Department has developed site investigation sampling methods for current or former farm fields and orchards (Addendum 5 of Task Force report).</li> </ul>
<ul style="list-style-type: none"> <li>The Department should authorize a remedial alternative involving soil blending for pesticide residues in soil in former agricultural areas when it is protective of human health. This represents a substantial departure from current State policy and the Task Force recommends blending as a remedial option only at sites with historical pesticide contamination.</li> </ul>	<ul style="list-style-type: none"> <li>✓ The Department now allows soil blending for sites with historic pesticide contamination, but not for other contaminated sites.</li> </ul>
<b>VIII. B. Department Oversight</b>	
<ul style="list-style-type: none"> <li>At the request of the property owner or developer, the Department should oversee the investigation and remediation of sites with historical pesticide contamination and issue a No Further Action Letter when no contamination is present above the Department's residential soil cleanup criteria or when the site has been remediated (i.e., appropriate exposure controls are applied).</li> </ul>	<ul style="list-style-type: none"> <li>Standard practice in the pre-existing voluntary cleanup program; no change was needed to adopt this recommendation.</li> </ul>
<ul style="list-style-type: none"> <li>The Department should provide local authorities (planning and zoning boards, local or county health departments) technical information and training as necessary.</li> </ul>	<ul style="list-style-type: none"> <li>✗ The Department does not provide technical information and training targeted specifically on historic pesticide contamination to local authorities.</li> <li>For municipalities considering adopting requirements for soil testing and remediation, the Department recommends that municipalities require parties to follow Department guidelines for soil testing and remediation and obtain No Further Action letters from the Department through the existing voluntary cleanup program, rather than institute separate technical requirements.</li> </ul>

HISTORIC PESTICIDE CONTAMINATION TASK FORCE RECOMMENDATIONS	NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION ACTIONS
<ul style="list-style-type: none"> <li>No additional action should be required at a site when information obtained by a review of the site history indicates no historic pesticide use or when sampling confirms no pesticide contamination at levels above the Department's residential soil cleanup criteria.</li> </ul>	<ul style="list-style-type: none"> <li>Except for allowing soil blending as a remedial approach (see below) the requirements for and opportunities to receive a No Further Action letter have not been changed based on the recommendations of the Task Force. No Further Action letters are issued on a site-by-site basis and can generally be issued when information confirms that contamination is not present above residential soil cleanup criteria.</li> </ul>
<b>C. Application of Remedial Strategies</b>	
<ul style="list-style-type: none"> <li>The remedial strategies described in this report are recommended as acceptable for soils with historical pesticide contamination.</li> <li>Remedial options (abbreviated): <ol style="list-style-type: none"> <li>Consolidate and cover contaminated soil on-site under buildings, roads, or other approved areas; file deed notice.</li> <li>Cap contaminated soil with clean topsoil; file deed notice.</li> <li>Blend contaminated soil with clean soil within the area of concern.</li> <li>Blend contaminated soil with clean soil outside the area of concern but within the site.</li> <li>Remove contaminated soil and replace with clean soil.</li> <li>Treat contaminated soil to the Department's residential soil cleanup criteria (not considered practicable).</li> </ol> </li> </ul>	<ul style="list-style-type: none"> <li>Remedial options 1, 2, 5, and 6 continue to be allowed for soils with historic pesticide contamination, as they are and have been allowed for other contaminated sites; no change was needed to adopt this recommendation. <ul style="list-style-type: none"> <li>✓ The Department changed its policy to allow soil blending for soils with historic pesticide contamination (remedial options 3 &amp; 4).</li> </ul> </li> </ul>
<ul style="list-style-type: none"> <li>The remedial strategies described in this report should not apply to other areas of concern on agricultural properties such as underground storage tanks or pesticide mixing and storage areas.</li> </ul>	<ul style="list-style-type: none"> <li>✓ The remedial strategies for soil blending (options 3 and 4) apply only to agricultural soil, not to other areas of concern on agricultural properties.</li> <li>The other remedial strategies were already available, and continue to be available, for all contaminated sites; no change were made to state requirements concerning remedial options 1, 2, 5, and 6.</li> </ul>
<ul style="list-style-type: none"> <li>One or more remedial options may be used at a site based on site conditions and development plans.</li> </ul>	<ul style="list-style-type: none"> <li>Standard practice in the pre-existing voluntary cleanup process; no change was needed to adopt this recommendation.</li> </ul>

HISTORIC PESTICIDE CONTAMINATION TASK FORCE RECOMMENDATIONS	NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION ACTIONS
<ul style="list-style-type: none"> <li>The use of grass and landscaping as an exposure control should only be allowed as part of an exposure control strategy when approved by the Department.</li> </ul>	<ul style="list-style-type: none"> <li>Standard practice in the pre-existing voluntary cleanup process; no change was needed to adopt this recommendation.</li> </ul>
<b>IX. D. Real Estate Disclosure</b>	
<ul style="list-style-type: none"> <li>The Department should provide site-specific data concerning historic pesticide residue contamination in soil in its geographical information system (GIS) and allow public access through each municipal clerk's office, in accordance with "The New Residential Construction Off-Site Conditions Disclosure Act" (P.L. 1995 c.253).</li> </ul>	<ul style="list-style-type: none"> <li>× The Department maintains a GIS database with site-specific data on soil and ground-water testing conducted at known contaminated sites in New Jersey, including sites with historical pesticide contamination. Currently only data on ground-water contamination are available to the public in GIS format, but the Department plans to provide additional data, including data on soil contamination from pesticides, to the public through an Internet map server.</li> </ul>
<ul style="list-style-type: none"> <li>Real estate professionals and the Department should develop model language in contracts informing buyers of soil contamination where appropriate, and create informational materials to explain the issue in some detail and provide buyers with contacts for more information to further educate the public.</li> </ul>	<ul style="list-style-type: none"> <li>× The Department has not worked with real estate professionals to develop model language in contracts for disclosure of information on historic pesticide contamination.</li> <li>× The Department has not developed informational materials concerning the issue of real estate disclosure at historic pesticide contamination sites, although a Fact Sheet on historic pesticide contamination, which includes individual protection measures, has been developed (see above).</li> </ul>
<ul style="list-style-type: none"> <li>Sellers should provide prospective buyers with any test results that have been performed to quantify concentrations of residual pesticides that a prospective buyer requests and provide information regarding any deed notice and/or maintenance requirements applicable to the property where pesticide contamination [exists] on the property.</li> </ul>	<ul style="list-style-type: none"> <li>Pre-existing laws and regulations require that sellers disclose information on test results that have been performed to quantify concentrations of contaminants (including agricultural pesticides) and information regarding any deed notice and/or applicable maintenance requirements for contaminated properties to prospective buyers. No change was needed to adopt this recommendation.</li> </ul>
<ul style="list-style-type: none"> <li>Sellers should provide a written disclosure to prospective purchasers of the location and conditions of common areas where contaminated soil has been consolidated in accordance with the Department's applicable soil remediation criteria.</li> </ul>	<ul style="list-style-type: none"> <li>Pre-existing laws and regulations require that written disclosure be provided through deed notices, which the Department requires when any contaminated soil has been consolidated on sites. No change was needed to adopt this recommendation.</li> </ul>

<b>HISTORIC PESTICIDE CONTAMINATION TASK FORCE RECOMMENDATIONS</b>	<b>NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION ACTIONS</b>
<ul style="list-style-type: none"> <li>The State should only require a Deed Notice on the actual property where the contaminated soil has been consolidated, such as the common areas, and not on the deed of each individual property in the development.</li> </ul>	<ul style="list-style-type: none"> <li>In a development, if individual properties were cleaned up to meet state cleanup standards and contaminated soil were consolidated in a different area, such as a common area, it was already standard practice in the pre-existing voluntary cleanup process to require a deed notice only in areas where contamination remains above state standards. No change was made in response to this recommendation.</li> </ul>
<ul style="list-style-type: none"> <li>Municipal clerks maintain information concerning the presence of contaminated soil in the common areas for the benefit of subsequent purchasers pursuant to the Off Site Disclosure Act.</li> </ul>	<ul style="list-style-type: none"> <li>Pre-existing laws and regulations require that municipal clerks maintain information on the presence of known contaminated sites, including any sites that have areas where contaminated soil remains in place above state cleanup standards. No changes were made in response to this recommendation.</li> </ul>
<b>X. E. Public Education and Outreach</b>	
<ul style="list-style-type: none"> <li>The Department should develop a comprehensive public education program and outreach system for providing historic pesticide contamination information to the public and local authorities.</li> <li>Outreach should include, a Department "Hotline" phone number, brochures and information on the Department web site.</li> </ul>	<ul style="list-style-type: none"> <li>✓ The Department maintains a website on the Historic Pesticide Contamination Task Force that includes the Task Force's final report and a fact sheet for homeowners, homebuyers, and other members of the public.</li> <li>× The Department has not developed a comprehensive public education and outreach system for providing information on historic pesticide contamination, beyond the public outreach and education conducted during the Task Force process.</li> <li>× The Department has a telephone hotline number to report environmental incidents, abuses, and complaints, but does not have a hotline for information on issues related to historic pesticide contamination.</li> </ul>
<b>XI. F. Research Needs</b>	
<ul style="list-style-type: none"> <li>Research the bioavailability of arsenic and other historical pesticides from soils.</li> </ul>	<ul style="list-style-type: none"> <li>× The Department has not conducted additional research in response to the Task Force's recommendations.</li> </ul>
<ul style="list-style-type: none"> <li>Evaluate the effectiveness and cost of various remedial strategies for reducing concentrations of historical pesticides in soils, including treatment technologies.</li> </ul>	<ul style="list-style-type: none"> <li>× The Department has not conducted additional research in response to the Task Force's recommendations.</li> </ul>

HISTORIC PESTICIDE CONTAMINATION TASK FORCE RECOMMENDATIONS	NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION ACTIONS
<ul style="list-style-type: none"> <li>• Research potential impacts on ground water quality in vulnerable soils within agricultural areas.</li> </ul>	× The Department has not conducted additional research in response to the Task Force's recommendations.
<ul style="list-style-type: none"> <li>• Monitor the economic impacts of the policies and recommendations.</li> </ul>	× The Department has not conducted additional research in response to the Task Force's recommendations.
<ul style="list-style-type: none"> <li>• Initiate a state-wide sampling investigation of historical pesticides in soil including sensitive use areas.</li> </ul>	× The Department has not conducted additional soil sampling in response to the Task Force's recommendations.

Sources: Historic Pesticide Contamination Task Force, *Final Report: Findings and Recommendations for the Remediation of Historic Pesticide Contamination*, March 1999, available at <http://www.state.nj.us/dep/special/hpctf/index.html> and telephone interviews with New Jersey Department of Environmental Protection staff, conducted in July 2002.

## Wisconsin's Efforts to Identify and Address Historical Pesticide Contamination

The Wisconsin Department of Agriculture, Trade, and Consumer Protection (DATCP) oversees the cleanup of sites with lead and arsenic contamination from historical mixing, loading, and application of pesticides. Wisconsin's Lead Arsenate Program, now housed within DATCP,<sup>14</sup> is developing and implementing a proactive approach to prevent contact with contaminated soils at lead arsenate sites. This approach, which has only been partially implemented to date, consists of the following actions.

### To date, the Lead Arsenate Program has been:

- Educating the public about potential lead and arsenic contamination at old orchard sites, recommended individual protection measures, and requirements for disclosure during property transactions.
- Recommending the use of protective physical barriers such as sod, pavement, or gravel and/or requiring additional protective measures where appropriate.

### Within the next year, the Lead Arsenate Program plans to continue the above activities and take the following additional actions:

- Identifying former orchard locations through research of historical aerial photographs.
- Tracking information on those sites in a GIS database and providing access to that database to realtors, property owners, and the public through the Internet.
- Working with the Wisconsin Realtors Association to produce a special disclosure form for former orchard properties for use in property transactions.

Activities of the DATCP Lead Arsenate Program are currently funded largely by a grant from the Environmental Protection Agency. DATCP received a grant from EPA for about \$77,000 for fiscal year 2002 (with an additional \$13,000 provided by DATCP) to identify old orchard sites, develop the GIS database and Internet map server, and conduct public education and outreach.

## **XII. Cleaning Up Sites with Lead Arsenate Contamination in Wisconsin**

In Wisconsin, properties with arsenic and lead soil contamination from pesticides are typically cleaned up through the state voluntary cleanup program, after the land use has changed from agricultural to non-agricultural uses. To assist property owners and developers in identifying areas of potential lead and arsenic contamination and conducting any necessary cleanup of former orchard sites, DATCP has developed guidance for site assessment and cleanup of former orchard sites based on three categories of sites. These site categories, along with any associated requirements for site assessment and cleanup, are as follows.

1. Background level (naturally occurring) sites, which have arsenic concentrations below 5 ppm and lead concentrations below 50 ppm. No action is required for these sites.
2. Pesticide-use level sites, which have arsenic concentrations between 5 and 100 ppm and lead concentrations between 50 and 400 ppm. DATCP recommends that basic site management

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<sup>14</sup> Based on studies of former orchards in Door County, the Wisconsin Department of Natural Resources (DNR) and the Wisconsin Department of Health and Family Services concluded that some action was needed to address risks from exposure to elevated levels of arsenic and lead in soil at former orchard properties. Responsibility for ensuring that sites with lead arsenate contamination are identified and cleaned up was later transferred from DNR to DATCP.

practices—installation and maintenance of protective barriers—and individual protection measures are followed for these sites.

3. Priority level sites (spills, mixing and loading sites, etc.), which have arsenic concentrations above 100 ppm and lead concentrations above 400 ppm. In addition to the basic site management practices described above, DATCP requires active cleanup and site management practices for priority-level sites to ensure that they are cleaned up to pesticide-use levels or approved alternative remedial actions are implemented.

Wisconsin's general cleanup levels, called clean closure goals, are 0.039 ppm for arsenic in soil and 50 ppm for lead in soil for non-industrial sites. Wisconsin state law does, however, allow natural soil background concentrations, which average around 5 ppm for arsenic, to be used instead of these standards on a site-specific basis. The corresponding general cleanup levels for Washington are 20 ppm for arsenic in soil and 250 ppm for lead in soil, higher than Wisconsin's general cleanup levels. The interim action levels for child-use areas within the Tacoma Smelter plume are 100 ppm for arsenic and 700 ppm for lead, as compared to the action levels the Wisconsin Lead Arsenate Program has set for priority-level pesticide sites of 100 ppm arsenic and 400 ppm lead.

More information on Wisconsin's Lead Arsenate Program, including a guidance document and a question-and-answer fact sheet, is available from this website:

[http://datcp.state.wi.us/arm/agriculture/pest-fert/pesticides/accp/lead\\_arsen.htm](http://datcp.state.wi.us/arm/agriculture/pest-fert/pesticides/accp/lead_arsen.htm)